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COVER: A composite of two infrared satellite images of the island of Taiwan used by Naval Medical Research Institute scientists in developing a distribution model for Japanese encephalitis. Story on page 30.

Corpsman Helps Salvage Air Florida Jetliner

With as many as 60 divers in the icy waters of the Potomac River each day, Navy hospital corpsman and diver HM2 Robert Walker constantly had to remain alert.

Walker, a member of the team of divers and support personnel who recovered the victims and wreckage of the Air Florida Boeing 737 that crashed in Washington, DC, 13 Jan 1982, was responsible for the safety of the people at the scene.

"I saw the wreck for the first time the night of January 13," said Walker. "It was eerie—just the tail and top of the fuselage showed through the ice."

Air Florida Flight 90 crashed shortly after takeoff from nearby National Airport and 74 passengers died and 4 motorists were killed when the aircraft struck the 14th Street Bridge. The wreckage lay in about 25 feet of water bracketed by the bridge's spans.

"It wasn't a difficult salvage job, but the number of casualties made it hard," Walker went on. "It was the first time many of the divers had been involved in recovering bodies, and it bothered them. It bothered me most after it was all over."

Walker made one dive and acted as standby diver, ready to assist other divers during the recovery operation. He also acted as safety inspector.

"I was responsible for the safety of the guys, and I was on the diving platforms or in a small boat constantly watching for hazards," he said.

"The ice made getting in and out of the water dangerous. There were a lot of cables and sharp debris on the bottom that could have snagged or cut the divers. The biggest danger was the cold. I was always alert for signs of hypothermia."

The recovery was hampered by record-setting cold temperatures and snow and ice storms.

Sixty-five people from the Explosive Ordnance Disposal School at Indian Head, MD, as well as other Navy, Coast Guard, and Army divers, took part in the 12-day operation.

"There was no trouble coordinating the divers from the three services because they all get their training from the Navy's diving school," Walker explained.

The divers recovered all the victims and 98 percent of the plane, including the flight data and pilot voice recorders.

The 25-year-old Navyman received his diver training from Navy Mobile Diving and Salvage Unit Two, which operates a second class diving school in Norfolk, VA.

Second class divers learn medicine, physics, and how to use scuba and surface-supplied lightweight and "hard hat" diving rigs. They also learn to use cutting and welding torches and pneumatic and hand tools underwater.

"I enlisted in the Navy with the idea of being a diver," Walker said. "I was a certified scuba instructor before I came in. I chose to become a hospital corpsman because I was interested in medicine. It's one of the source ratings for diver training."

Walker attended diving medical technician school in Panama City, FL, and instructor school before reporting to the Explosive Ordnance Disposal School as an instructor in July 1981.

"I teach diving and also diving medicine like physiology, anatomy, recompression chamber physics, and diving diseases and injuries," he said.

Explosive ordnance disposal technicians are responsible for disarming any ordnance in water or on land. Besides training in a variety of diving skills, they learn to locate, identify, evaluate, and render safe explosives from Civil War artillery shells to modern missile warheads.

Walker feels one of the best benefits of his 6-year Navy career has been education. "I'm just a few credits short of earning my associate's degree, and I plan to get my bachelor's degree in either oceanography or marine biology," he said.

—Story by Glenna Houston, Navy Public Affairs Center, Norfolk, VA. Photo by Carolyn Harris. □

HM2 Walker (right) helps diver into a Mark 12 suit. Walker teaches diving medicine at the Navy's Explosive Ordnance Disposal School.

Triage

Application of Concepts and Review

CAPT William H. Gondring, MC, USNR-R

The word triage is derived from the French word trier, meaning to sort, cull, or select.(*1*) *Dorland's Medical Dictionary* defines triage as:

- the process of sorting victims to determine priority for appropriate place of medical treatment; or
- the determination of priority for action in an emergency.(*2*)

Stedman's Medical Dictionary defines triage as:

- the medical screening of patients to determine their priority for treatment;
- the separation of a large number of casualties in military or civilian disaster medical care into three groups; those who cannot be expected to survive even with treatment, those who will recover without treatment, and a priority group of those who need treatment in order to survive.(*3*)

Triage, however, is defined here as a method of handling mass casualties involving diagnosis, classification, and separation of casualties for further treatment, emergency resuscitation, and subsequent evacuation (Table 1).(*4*) Triage is the most important aspect in managing mass casualties. Its strategy is based primarily on the principle that evacuation is not urgent, but primary treatment, emergency resuscitation, and preparation for evacuation is urgent. This primary treatment and emergency resuscitation includes maintenance of the airway, hemostasis, fluid replacement, and proper preparation of the wounded for evacuation in order to prevent complications during transport. Continuity of care is provided by proper casualty recording (Table 2).(*5*)

Casualty triage involves preplanning for either the military action or the possibility of an accidentally occurring disaster in an area of earthquake potential, near a factory producing organophosphates, and/or in the environs of a nuclear power plant, coal mine, or oil well. These scenarios only suggest possible mass casualty situations; each individual situation has its own specific problems that must be solved, first of which is triage of casualties.

Medical personnel assigned to triage should be trained and organized as to each of the functions in the initial triage process. Responsibilities should be planned and delegated because direct, clear-cut lines of authority are critical to an efficient operation of a triage facility. An experienced physician trained in life support (maintenance of cardiorespiratory function, hemorrhage, control of shock, and casualty recording) should be directly involved and designated the triage officer. The triage officer, usually a senior and experienced surgeon, performs the triage often with the help of the anesthesiologist, and/or orthopedic surgeon.

The criteria for triage sorting can be categorized as:

- immediate treatment;
- delayed treatment;
- minimal treatment; and
- expectant treatment (Table 3).(*6-9*)

As a practical matter, sorting begins with the casualty himself, i.e., he is either ambulatory or nonambulatory.

The first category of casualties requiring immediate treatment includes respiratory obstructions from mechanical causes, sucking chest wounds, tension pneumothorax, asphyxia, maxillofacial wounds, neck wounds, shock produced by major internal hemorrhage, evisceration, pericardial injuries, major muscle damage, external hemorrhage, extensive fractures of long bones, multiple wounds, and burns of 20 percent or greater. Vascular injuries requiring repair, all injuries requiring a tourniquet, closed or open cerebral injuries with increased loss of consciousness, and nerve agent intoxica-

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tion also require immediate treatment.

Intra-abdominal injuries including perforations of the gastrointestinal tract, wounds of the biliary and pancreatic system, wounds of the genitourinary tract, thoracic wounds without asphyxia, thermal or vesicant burns under 20 percent, and/or injuries involving the face, hands, genitalia, and perineum come under the delayed treatment category. This also includes acute-severe radiation sickness, lung damage caused by chemical agents, closed fracture of major bones, moderate lacerations without severe hemorrhage, second degree burns of 20-40 percent of the body and/or incapacitating burns of the face and hands, injuries to the eyes, maxillofacial injuries without asphyxia, and noncritical central nervous system injuries.

The ambulatory patient (walking wounded) requires minimal treatment and may be carried out by less skilled personnel under supervision. This category includes minor lacerations, contusions, sprains, partial thickness burns less than 20 percent excluding the hands and face, and psychiatric disorders. Patients in this cateogry are not evacuated; they are directed to return to their battle stations aboard ship.

The expectant category includes those patients so critically injured that only prolonged and complicated treatment—treatment that is probably not available within the area of evacuation—may offer any increased life expectancy. Such examples are severe central nervous system injuries, severe burns greater than 40 percent of full thickness, massive doses of ionizing radiation greater than 1,000 rads—LD50 500 rads—(the LD50 is within the range of 500 rads),(*10*) and severe penetrating wounds of the abdomen.

This classification of immediate, delayed, minimal, and expectant treatment is incomplete, but detailed enough to provide some idea of how injuries should be classified. Clinical assessment of patients with multiple injuries does involve the risk that some aspect of extreme trauma may be overlooked. When the triage officer assesses multiple injuries he must assess the active motion of all extremities, document bruising, and determine peripheral nerve injuries. Even so, physicians providing definitive care further along the line must be alert to diagnostic failures in those patients with multiple injuries.

The triage process further involves the effectiveness of pretrained medical assistants functioning to assist the triage officer in the use of medical equipment. Medical personnel should be trained in the initial sorting classification process. This includes:

- removing outer clothing, underclothing, and shoes of all patients;
- decontamination and/or radiation monitoring;
- obtaining and recording vital signs;
- transcribing for the triage officer and attaching completed records to each individual patient;
- cardiorespiratory assistance;
- emergency care with use of pressure bandages;
- IV fluid teams;
- use of communications radio net;
- evacuation assistance with knowledge of priorities; and
- controlling flow of patient traffic.

This triage process also infers that necessary medical equipment is available and easily accessible. The medical equipment has to be in common use, of known terminology, and simple to operate. Equipment and personnel must be exercised periodically to maintain readiness.

TABLE 1. Processes of Triage

1. Decontamination
2. Classification
3. Life Support
4. Priority Evacuation

TABLE 2. Casualty Sequence Flow

Casualty
↓
Sorting and Life Support
↓
Evacuation
↓
Definitive Treatment

TABLE 3. Triage Treatment Priority

1. Immediate
2. Delayed
3. Minimal (Walking Wounded)
4. Expectant

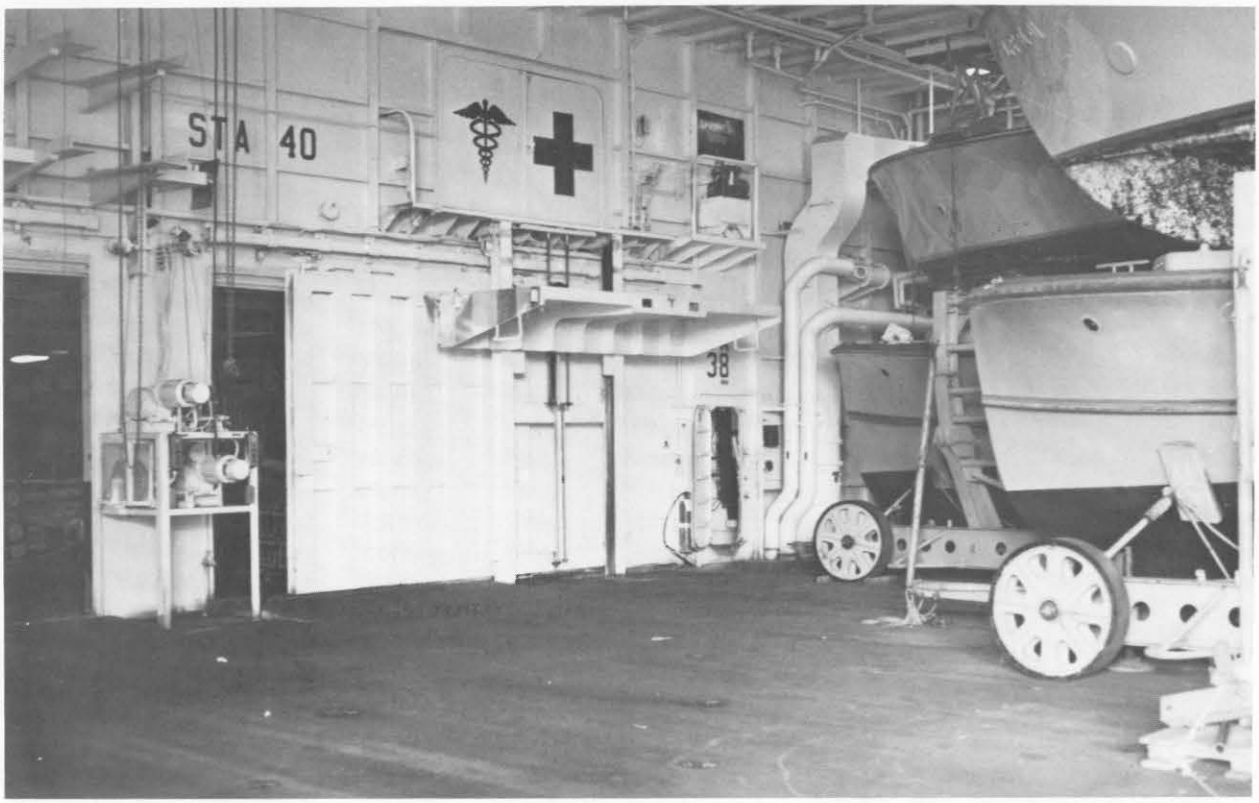

FIGURE 1. The hangar deck aboard USS New Orleans *(LPH-2) is one potential area that would be used for triage.*

The triage location must be as close to the area of involvement as safety will permit. It must be a large, well lit, uninterrupted space allowing free movement and an unobstructed view of the entire area (Figures 1 and 2).(*4*)

A simple, reliable communications system dedicated only to this function should link the triage area to the site of definitive treatment.(*12*) Whether the communication system is radio or hand phone, all involved personnel must be familiar with the triage process and the type of information that must be transmitted. If the tactical situation warrants, information should be encrypted.

Supplies should be readily accessible. Sterile, prepacked tracheostomy and cut-down chest tube emergency sets should be centrally located. Simple instruments for maintaining airways—laryngoscopes, several sizes of endotracheal tubes, the AmBu respirator, mechanically operated suction pumps and trochars for intercostal drainage, oral pharyngeal airways, and hand-ventilated bags and masks should be available at other locations. Ample supplies of IV fluids including Ringers lactate and dextrin to combat shock should be readily available with large-bore needles, preferably percutaneous venous catheters greater than 18 gauge. The triage space should be equipped with sterile dressings and equipment for hemostasis, varying from pressure sterile dressings to clamps, small suture sets, and tape.

Special contingencies may involve organophosphate poisoning. Therefore decontamination equipment including bleaching agents such as sodium hypochlorite and water should be available along with atropine styrets in 2 mg doses.

The maintenance of casualty records is equally important. They must include the patient's name; time; mode of injury; vital signs; level of consciousness; diagnosis; drug information including drug dosage, time administered, and the route given; the use, time, and placement of the tourniquet; treatment given for individual wounds; and most importantly, the evacuation priority.

Casualty evacuation may involve stretcher-bearers, ambulances, or helicopters. Proper preparation of the injured for evacuation is essential in order to prevent complications during transport. Distance to be traveled, appropriate dressings, splinting, analgesics, care of IV bottles, and casualty recording must all be considered.

The problem of handling large numbers of casualties is not limited to hospitals. It exists at all levels throughout the entire chain of medical evacuation. The basic principles of sorting and patient classification must be understood by all medical personnel. Since situations vary greatly, flexibility in the application of these principles must be an established part of military medical training. Moreover, the efficient operation of triage must be coupled with clear-cut,

FIGURE 2. The predetermined triage open space aboard USS Belleau Wood *(LHA-3) is designed for triage and minor surgery.*

preplanned lines of authority. Medical units which may have to bear the burden of a mass disaster should have a clearly outlined disaster plan and participate in regularly scheduled and nonscheduled realistic training exercises.

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Hypothermia

CDR Donald C. Arthur, MC, USN

Prevention

Conclusion

The key to management of hypothermia is prevention. There is no magic to it, just common sense. First, keep warm. Secondly, if you must enter a cold environment, be properly prepared. Third, if you can do neither of the first two, or they are ineffective, conserve body heat by a proven method.

Keeping warm is strictly a common sense step. Be adequately clothed for the weather; if it's raining, wear waterproof gear, if it's cold, wear clothing in layers. Layering has been shown to be the most effective method of wearing a given weight of clothing. That is, wear a T-shirt, long underwear, a regular outer shirt, insulating vest, thick outer coat, and then a water repellent garment. This is much better than just a shirt and one heavy coat. Insulation effect is based on trapped air as the insulator and the more layers worn, the more air is trapped. Wool has been shown to be the best clothing material because of its superior air-trapping and ability to retain its insulating properties when wet. It is important to note the need for head protection. Because the scalp vessels do not significantly vasoconstrict, heat loss from the head can be as high as 80 percent of the total heat loss. Hence, wear a wool watch cap, hood, or balaclava.

Expose as few people to the cold as possible. Personnel not directly involved in cold weather or diving operations should be inside where it's warm. This is especially true for divers who will be exposed to exceptional stresses when they enter the water. After exposure to the cold, be sure to warm up *completely*. It is counterproductive to warm the extremities so that they just feel good, then return to the cold. This has two effects. First, cold extremities would vasodilate allowing the cool muscle to reduce the temperature of increased blood flowing through them, thereby secondarily cooling the core. Secondly, this vasodilation will cause heat loss from the extremities at a much greater rate when returning to the cold environment. If one must return to the cold environment in a short time, it is better to remain cold and peripherally vasoconstricted than to warm up partially because of these deleterious effects of vasodilation and re-exposure.

Protective clothing not only pertains to topside personnel, but also to divers. Generally, there are three types of exposure suits available, the free-flowing hot water suit, the wet suit, and the dry suit.

The free-flowing hot water suit requires extensive shipboard facilities and is intended for use in tethered systems. It is loosely fitting and constructed of a closed-cell neoprene material open at the ankles and wrists. This allows warmed water to circulate freely throughout. This system is only of value in large scale diving operations. Skin maceration due to constant immersion in warm water is often the time-limiting factor.

The wet suit is a skin-tight garment constructed of 3/16″ or 1/4″ closed-cell neoprene rubber. It is designed to fit snugly enough that outside water is prohibited from circulating next to the skin. The insulating ability of this system is based on gas trapped in the closed-cell foam construction of the neoprene. The gas, however, is compressed (according to Boyle's Law) when descending so that at 4 atmospheres of pressure (approximately 100 feet), the insulating ability is reduced to only 25 percent of what it is at the surface. This system is, therefore, quite ineffective at significant depths.

The dry suit, in contrast, completely isolates the diver from direct contact with the water. It may be made of loosely fitting closed-cell neoprene (the Unisuit) or a tough snagproof rubber or rubberized canvas (the Mark 5 Deep Sea Diving Dress). Provision is made to add gas to the suit as the diver descends to keep the volume of the suit constant. The insulating value of the suit is a

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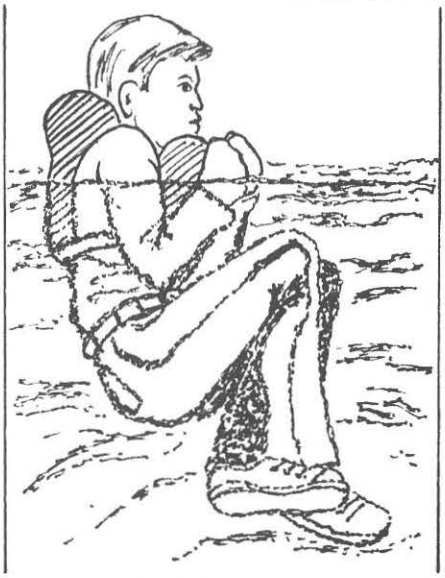
function of the type of undergarment worn, its thickness and the amount of gas trapped in the suit. Therefore, the diver should wear wool diving underwear, socks, and a wool watch cap. Air is a better insulator than helium. Thus, when diving HeO_2, there is a much greater potential for heat loss. The HeO_2 diver will become hypothermic at a much greater rate than with air.

Supplemental systems are being developed to allow warming of a layer of water held in a tube suit between the diver and the dry suit itself. This would decrease the temperature gradient between the diver and suit. An attempt is also made to heat the diver's inspired air to lessen the respiratory heat loss. This is, however, extremely difficult considering the long hose necessary to reach the diver at depth. Strict temperature control must be maintained when changing depth since, when ascending, there would be less cooling of the hot air by water and the diver could suffer respiratory tract burns.

Adequate surface intervals cannot be stressed enough. Thorough rewarming is the rule and a guideline is that one is adequately rewarmed when sweating begins. Good diet and fluid intake should be adhered to. Alcohol abstinence is imperative since alcohol is a vasodilator. Cigarettes and coffee or tea should be avoided because nicotine and caffeine are vasoconstrictors.

Finally, if all else fails or the effects of environmental cold surpass the body's efforts to maintain thermal homeostasis in the water, there are additional methods of heat conservation that are more accurately termed survival rather than preventive measures. Always wear a life jacket or an inflatable vest. Since the greatest amount of potential heat loss is through the head, keeping it out of the water is essential. Drownproofing is a very unsatisfactory procedure for this reason. Without flotation valuable energy must be expended to maintain oneself on the surface. With flotation two methods of heat conservation are recommended. If you're alone use the H.E.L.P. (Heat Escape Lessening Position) as shown in the illustration. The legs are crossed and bent with knees held toward the chin. The arms are wrapped around the legs or a flotation device. If possible, hands should be placed in the axillae. This posture lessens the body surface area in contact with the chilling water. If accompanied use the Huddle position (see illustration). This is done by remaining vertical in the water and closely holding your companions. These methods are the best for maintaining heat when immersed.

Art by Janean Panek



H.E.L.P. position

Huddle position

Remember, survival time in the water depends largely on two factors, the temperature of the water and the behavior of the victim. Prevention of hypothermia is very simple. In fact, it's common sense! Adherence to these few principles will not only decrease morbidity from hypothermia, but also increase the enjoyment of working in the cold environment.

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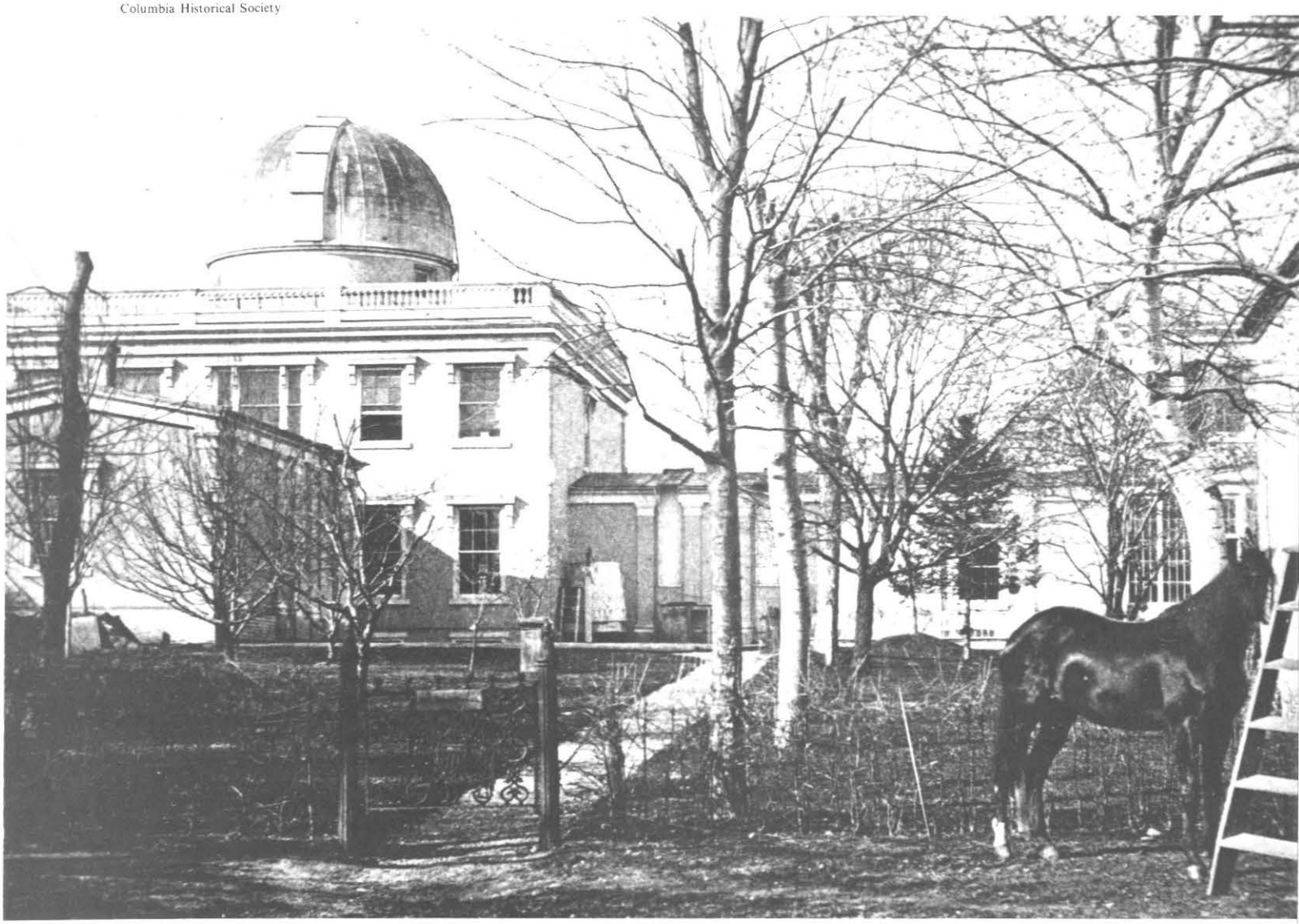
Columbia Historical Society



The Observatory as it looked at the end of the Civil War

Home of BUMED

a hilltop in foggy bottom

The Golden Age (Part 1)

Part four in a continuing series

The Civil War was over. Under a covered pavilion in front of the White House, President Johnson and GEN Grant reviewed the victorious armies as they passed in a last grand parade.

It was May 1865. Abraham Lincoln was dead and the plotters of his assassination were on trial for their lives at Washington's old Penitentiary.

On Observatory Hill, the Superintendent's residence had just received a new tenant, RADM Charles H. Davis. Davis, like his predecessors Maury and Gilliss, was a man of science. Although not an astronomer, he had published several articles concerning the relationship of geology on tides and currents. Before the Civil War, he served as Superintendent of the American Ephemeris *and the* Nautical Almanac, *key publications for navigators.*

During the next 12 years, under Davis' guidance and that of his successor, Commodore and later RADM B.F. Sands, the Observatory became renowned throughout the world. Many of its astronomers became active members of the National Academy of Sciences, an organization Davis helped found in 1863.

As an internationally recognized institution, the Observatory dispatched its scientists to Europe, Siberia, Gibraltar, Sicily, and remote locations in the United States to observe solar eclipses.

To record the transit of Venus across the face of the Sun 4 years later, eight well-trained and -equipped teams journeyed to Peking, Nagasaki, Vladivostok, Tasmania, New Zealand, Chatham Island in the South Pacific, and a remote whaling station, Kerguelen Island, in the South Indian Ocean.

In 1876 the Observatory helped the United States celebrate its 100th birthday in Philadelphia, proudly displaying evidence of its scientific achievements alongside those of the young Nation it represented.

The Observatory's correspondents, project co-sponsors, and visitors constituted a who's who of the world scientific community—Joseph Henry, Secretary of the Smithsonian Institution and President of the National Academy of Sciences; Henry Draper, pioneer of celestial photography; U.J.J. Leverrier, discoverer of the planet Neptune and pioneer in meteorology; Louis Agassiz, Swiss-born naturalist and Harvard College professor; John Wesley Powell, explorer of the Colorado River and first head of the U.S. Geological Survey.

Accurate timepieces calibrated from periodic astronomical observations made by its astronomers marked standard time for the Nation's railroads and many of its cities.

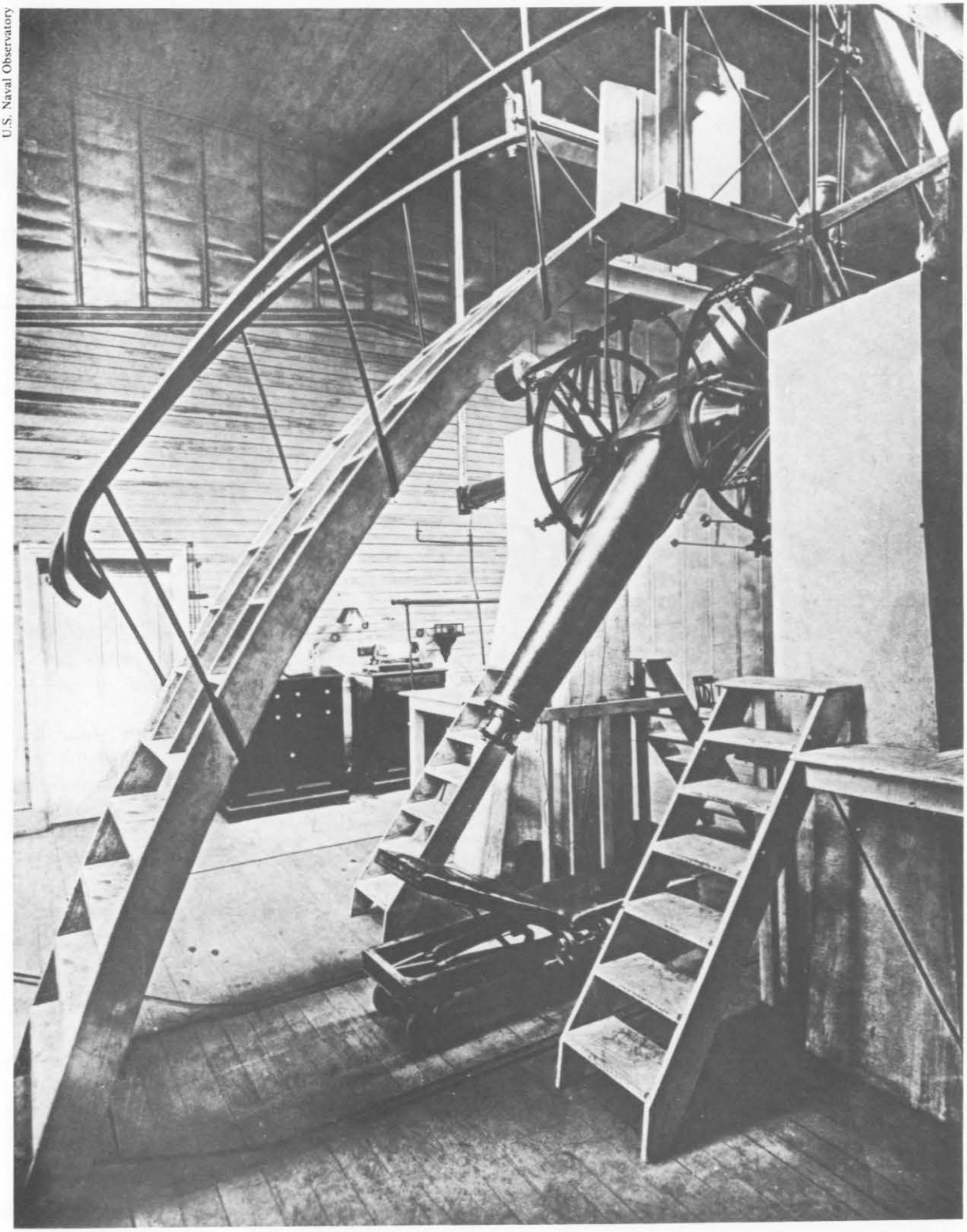
Surmounted by the Washington Time Ball, the Observatory's 9.6-inch telescope dome served as the central reference point by which were determined the longitudes of Havana, Cuba, Princeton, NJ, Bethlehem, PA, Detroit, MI, St. Louis, MO, Ogden, UT, and Carlin, NV.

The next two installments detail the Observatory's golden age—a glorious era of achievement for American science in which Observatory Hill played a central role.

The New Superintendent

When James Gilliss died suddenly in February 1865, Charles Davis was already a rear admiral, Chief of the Bureau of Navigation, and Gilliss' supervisor. Even though he saw action during the war in the blockade fleet and with David Farragut at Vicksburg, he was a scientist first and foremost. In May 1865 Davis appointed

U.S. Naval Observatory



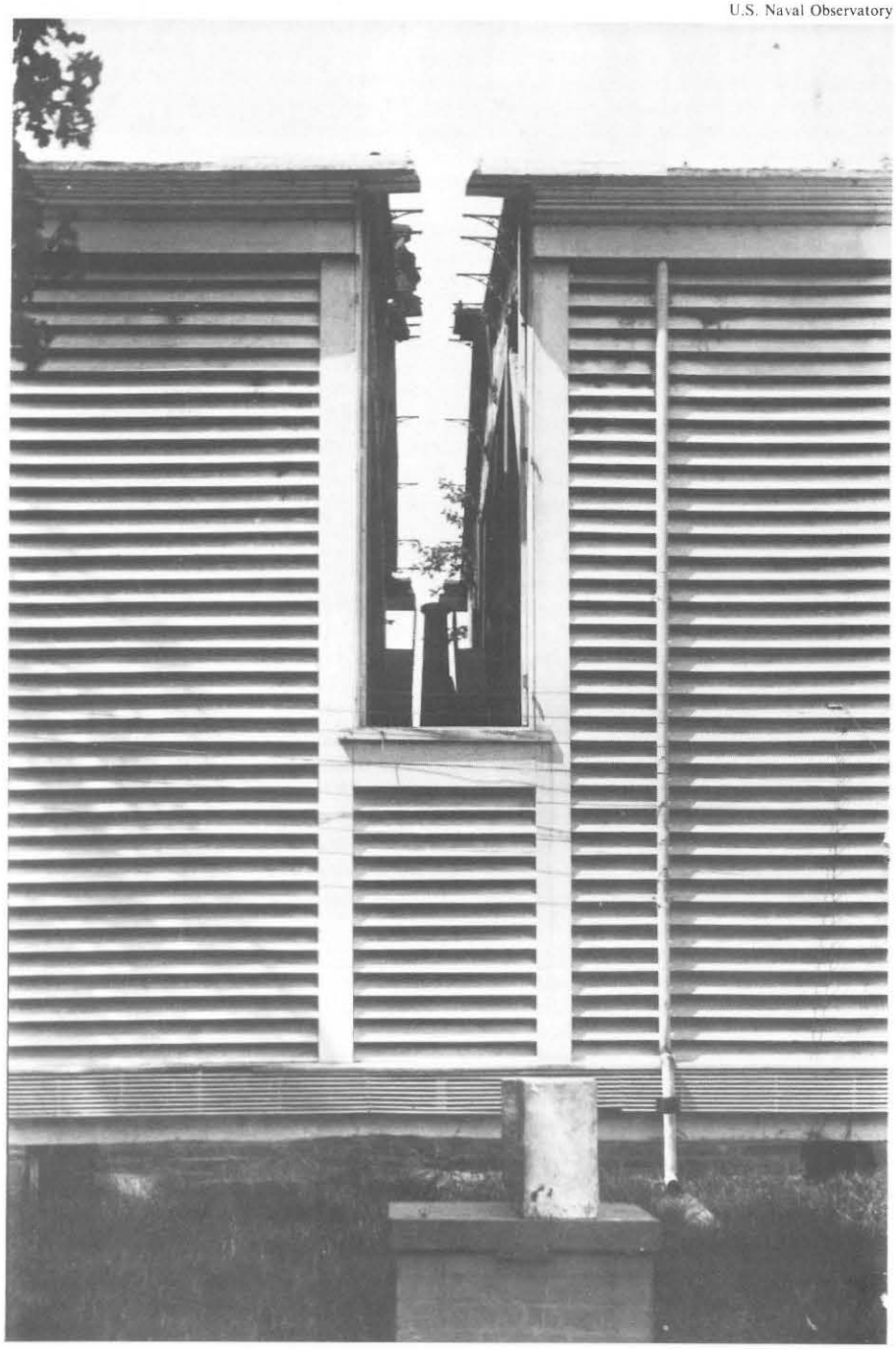
Simon Newcomb saw the installation of the new Transit Circle as the greatest event in the history of the Observatory.

RADM Davis U.S. Naval Observatory

himself Superintendent of the Observatory.

With the end of the war, the institution's role was to change. As early as August 1862, the Navy's scientific departments related to hydrography, astronomy, navigation, and surveying had been consolidated under the Bureau of Navigation. In 1866 the Hydrographic Office was formally separated from the Observatory and moved elsewhere in the city. Naval chronometers continued to be rated, and meteorological observations continued, but astronomy would never again be eclipsed by the creation and dissemination of sailing directions, wind and current charts, and other aids to navigation.

U.S. Naval Observatory



The dour-looking, bewhiskered Davis saw himself as the administrator of a full-time scientific establishment. He quickly passed out new assignments. Although Professor James Ferguson was in charge of the 9.6-inch refracting telescope, Professors Asaph Hall and John R. Eastman spent much of their time alternating in the observer's chair studying newly discovered asteroids.

Professor Mordechai Yarnall took charge of the east wing transit and mural circle. In the adjacent room LCDR Andrew W. Johnson, in addition to his routine duty of winding and rating chronometers, maintained the history of each instrument from the date of its manufacture and purchase by the Navy. Because the Observatory's time-keeping function had expanded, Johnson was responsible for insuring the accuracy of the mean-time standard clock based on periodic celestial observations, and overseeing the Observatory's growing timekeeping and time distribution functions. And each day at noon, Johnson activated the time ball.

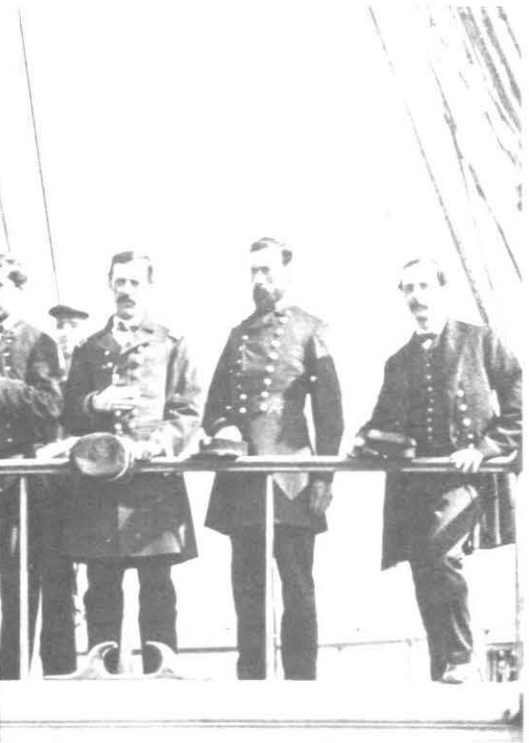
When Professor Eastman was not observing with the 9.6-inch telescope, he was meteorologist. This meant observing the mercury barometer; dry, wet-bulb, and Sun thermometers; wind vane; and rain gauge. These instruments, but for the latter, had to be observed every 3 hours beginning at midnight. Eastman read them himself or assigned the duty to subordinates.

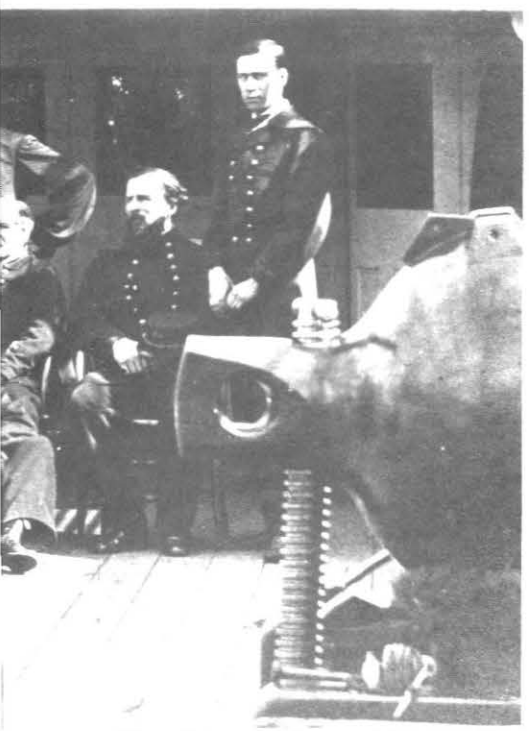
Transit Circle

The celestial instruments, although serviceable, had not kept up with the times. Gilliss knew this back in 1863

The louvered exterior of the new Transit Circle annex with its observing slit open. The instrument is visible in the center.

U.S. Naval Observatory





Off to Siberia: Officers of USS Mohican *and their guest, Professor Asaph Hall (seated third from left), depart San Francisco for Plover Bay on the Bering Sea, where Hall would observe the solar eclipse of 1869.*

(Right): From this improvised observatory at Des Moines, IA, Simon Newcomb, William Harkness, and John Eastman observed the same eclipse.

when he contracted with the German optical firm of Pistor and Martins for a transit or meridian circle, a versatile instrument that could determine precisely the fundamental positions of stars and planets.

Now it had arrived and the staff eagerly uncrated its components. Workmen removed the old meridian transit in the west wing and enlarged the structure by adding two large bays on the north and south sides. Under close supervision, they began mounting the new instrument on 23 Oct 1865, finishing the job 16 days later.

Professor Simon Newcomb could scarcely contain his excitement. He saw the mounting as the greatest event in the Observatory's history. American astronomers never again would have to rely on fundamental star positions established in Europe. By the beginning of 1866 the Observatory was truly on a par with the observatories in Greenwich and Paris.

Less than 2 years later, the brick transit circle room had become inadequate and a larger structure was therefore added to the west wing. It was a peculiar looking annex, its walls being made of tinned sheet iron only one fifteen-thousandth of an inch thick and covered on the outside by wooden slats to shade it from the Sun and help maintain equal inside-outside temperatures.(*1*)

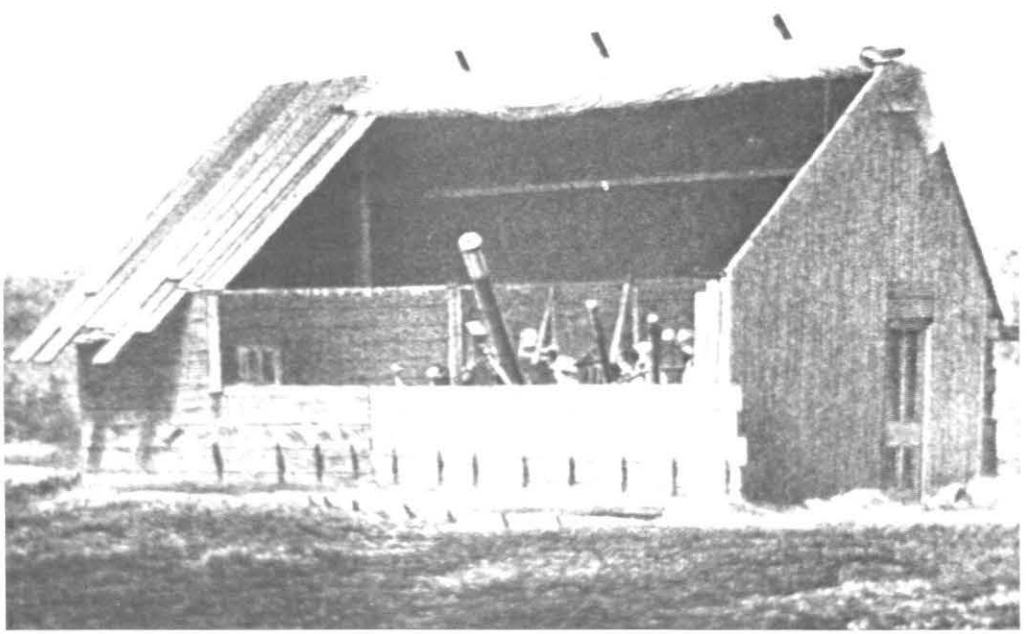
The old west wing became the new library and Professor Joseph E. Nourse its part-time librarian. From the original core of books purchased by Gilliss in Europe years before, the collection had grown to nearly 5,000 volumes. Many came from Gilliss' personal library and were donated by his widow.

Commodore B.F. Sands

Overseeing the institution's expanded operations was Commodore Benjamin F. Sands; RADM Davis had been recalled to sea duty in May 1867. The Observatory was not new to the 55-year-old Navy veteran. He had served there under Maury for 3 years before getting a sea command. Sands was neither an astronomer nor a true scientist, but had a sincere interest in oceanography that led to his invention of a deep-sea sounding instrument.

His Civil War career was an active one. In April 1861 he led the party that set fire to the Gosport Navy Yard at Norfolk. During the operation USS *Merrimack* was burned to the water-

U.S. Naval Observatory



line. He served in the Atlantic blockade squadron and participated in the final assault on Fort Fisher, NC, in December 1864. When the last Confederates surrendered on the Texas Gulf Coast on 2 June 1865 they did so aboard CAPT Sands' ship.(*2*)

A kindly, Merlinesque-like man in appearance, Sands prided himself on giving credit to his scientists when it was due. He supported both his military and civilian colleagues equally and pleaded their cause whenever he could.

The ambitious publication program begun under Gilliss and promoted by Davis continued under Sands. By 1876, when Davis was again Superintendent, the Observatory had published over 60 volumes of astronomical and meteorological observations, sailing directions, fundamental star positions, expedition reports, and longitude determinations.(*3*)

Eclipse Expeditions

To truly be an effective scientific laboratory, the Observatory's work could not be confined to its Washington headquarters. Studying astronomical phenomena such as lunar and solar eclipses and planet transits meant that well-equipped teams had to travel to wherever those events could best be observed. A rare opportunity to witness a total solar eclipse was to occur on 7 Aug 1869. Commodore Sands lobbied for and obtained a special appropriation to equip and dispatch two teams to observe the phenomenon.

Asaph Hall and an assistant proceeded to San Francisco, then sailed aboard a waiting naval vessel. They arrived at their destination, Plover Bay, on the east coast of Siberia on 30 July, set up their instruments, and waited for the weather to clear.

August 7th dawned cloudy and the disappointed astronomers got but a glimpse of what they had traveled half the world to see. Hall, normally the detached scientist, was moved by what he did see.

> About an hour before the beginning of the eclipse low cumulus clouds drifted rapidly from the west over the sky. As the clouds passed toward the east the partial eclipse was occasionally seen through the openings. On the approach of the total eclipse everything became hushed and still; the sea birds stopped their flights and the Indians huddled together in awe. As the shadow passed over the mountain the effect was startling. In the stillness and darkness of the moment it seemed as though all life had been swept from the earth. The fearful gloom of total eclipse was increased by the desolate appearance of the country, without tree or shrub, or anything pleasant to the eye.(*4*)

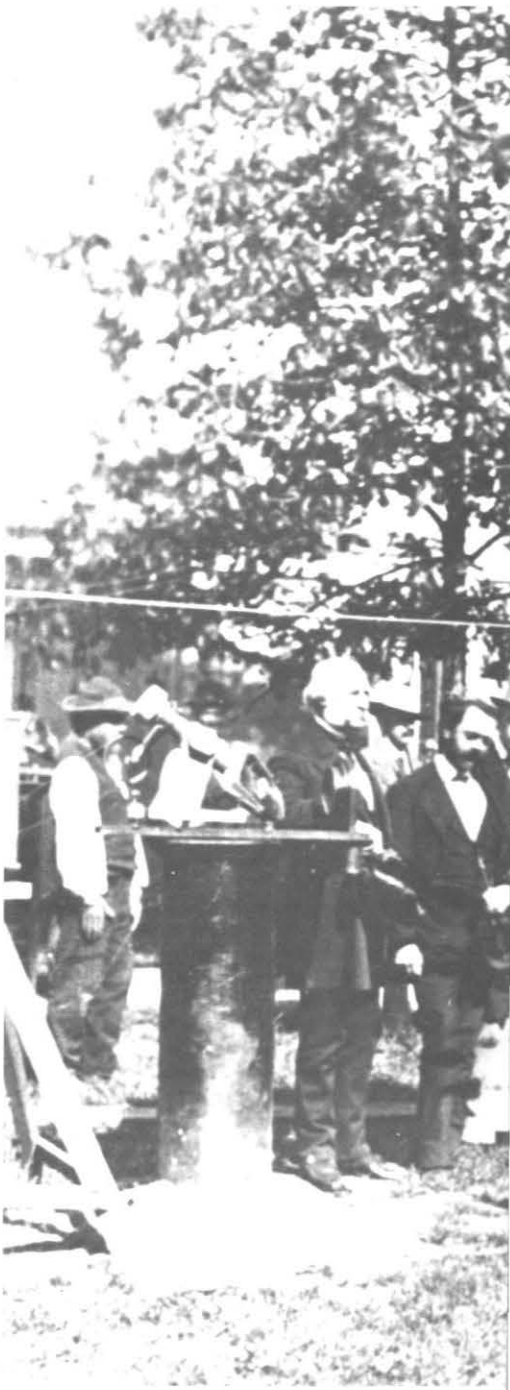
The other solar eclipse team of Professors Simon Newcomb, William Harkness, and John Eastman was more successful. After practicing for their expedition in a temporary wooden structure set up on Observatory Hill, they traveled by train to Des Moines, IA, and were treated to a clear August 7th. They observed and photographed the eclipse and brought back much useful data.

Mr. F.W. Bardwell, an Observatory aid, observed the eclipse from Bristol, TN.

No sooner did the teams return to Washington then they began preparing for the total solar eclipse of 22 Dec 1870. This time the expedition took them to Europe. Newcomb made his observations near Gibraltar. Hall, Harkness, Eastman, and Professor

U.S. Naval Observatory

Commodore Sands



Spring 1874: The transit of Venus Commission and field expedition members take time from their training for a group portrait near the dome of the newly built 26-inch refractor dome. RADM Davis stands near the heliograph at left; Professor Newcomb, in hat, is seated nearby.

U.S. Naval Observatory

Transit of Venus Teams
8 Dec 1874

1. *Peking*
2. *Vladivostok*
3. *Nagasaki*
4. *Kerguelen Island*
5. *Campbell Town*
6. *Hobart*
7. *Queenstown*
8. *Chatham Island*


BERING SEA
BERING SEA
SEA OF OKHOTSK
ALEUTIAN ISLANDS
ALEUTIAN ISLANDS
SUNDAY
MONDAY
OSTROV SAKHALIN
KURILSKIYE OSTROVA
SEA OF JAPAN
HOKKAIDO
HONSHU
TOKYO
INTERNATIONAL DATE LINE
INTERNATIONAL DATE LINE
Midway Islands
BONIN ISLANDS
Daito Shima
Iwo Jima
Maug
MARIANA ISLANDS
PACIFIC
Wake
UNITED STATES
(HAWAII)
Johnston Island
Guam
Taongi
MARSHALL ISLANDS
CAROLINE ISLANDS
Yap
Ulithi
Palau
Woleai
Ponape
Kusaie
Mili
Palmyra
Christmas Is
GILBERT ISLANDS
EQUATOR
Kapingamarang
NAURU
Ocean
BISMARCK ARCHIPELAGO
New Ireland
OCEAN
PHOENIX ISLANDS
LINE ISLANDS
IRIAN JAYA
PAPUA NEW GUINEA
SOLOMON ISLANDS
LOUISIADE ARCHIPELAGO
ELLICE ISLANDS
TOKELAU IS
COOK ISLANDS
SAMOA ISLANDS
NEW HEBRIDES
FIJI IS
FIJI IS
ILES DE LA SOCIE
TONGA IS
NOUVELLE CALEDONIE
ILES TUBUAI
Norfolk Island
Lord Howe Is
Kermadec Is
MONDAY
SUNDAY
CANBERRA
5
TASMANIA
6
NEW ZEALAND
7
WELLINGTON
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Campbell Is
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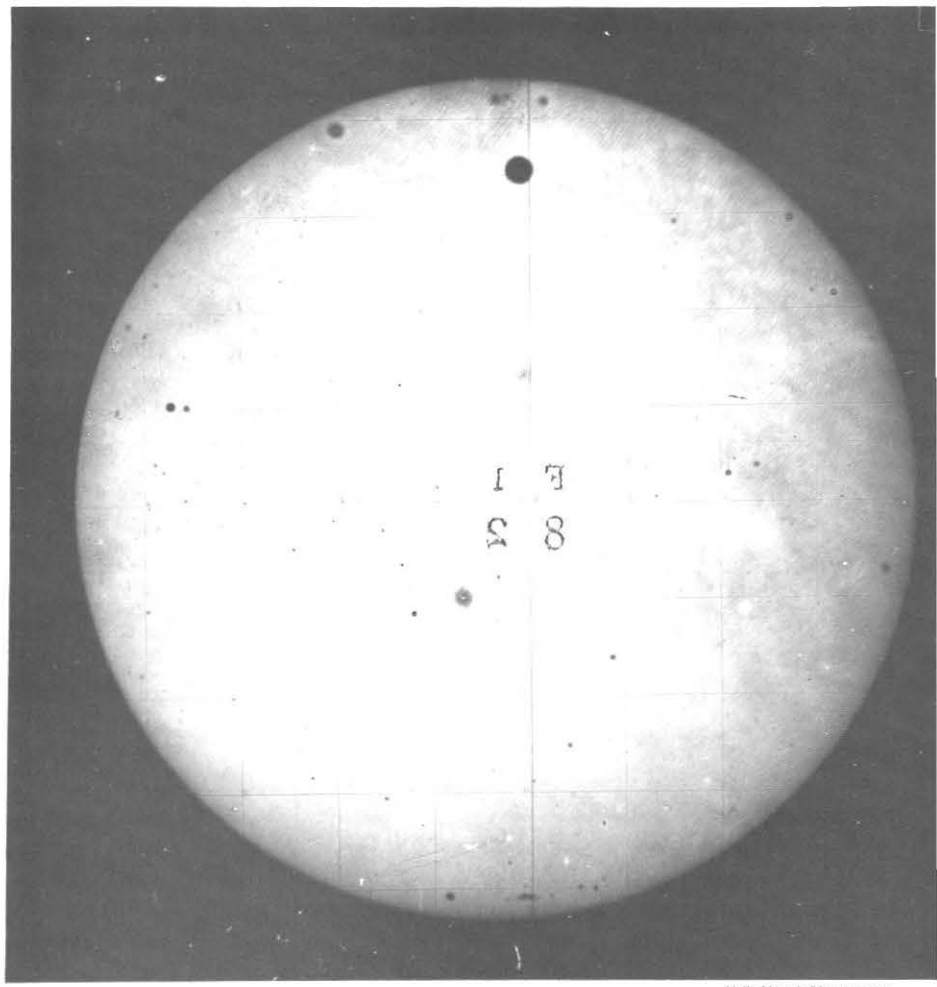
Peter I Island



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The eight Transit of Venus teams recorded the event, taking over 200 photographs by the wet plate process. Only 11 plates are known to remain. These two, taken at Nagasaki, show tiny Venus crossing the Sun.

Benjamin Peirce of the Coast Survey made theirs at Syracuse, Sicily.

Weather again played the spoiler. Newcomb had only limited success. An hour before the event "the southern heavens were covered with clouds, mist, and fog, which came in from the Atlantic."(5) Then came the drizzle, followed by partial clearing when the Sun and the Moon's shadow flitted in and out of view.(6)

The main object in studying the eclipse was to observe and record the structure of the Sun's corona and determine the path of the Sun's shadow across the earth. As with the previous year's eclipse the Observatory's astronomers met with limited success.

Transit of Venus

A year later preparations began for a celestial event that had not occurred in 105 years; the planet Venus was to transit the Sun on 8 Dec 1874. Eight nations either planned to conduct local observations or to send expeditions to where the transit could best be witnessed.

The Observatory's scientists hoped to measure accurately the distance from the Earth to the Sun by timing Venus' trip across the solar disk at several scattered locations in the far Pacific.

A Transit of Venus Commission was established made up of RADM Sands; Joseph Henry, Secretary of the Smithsonian Institution and President of the National Academy of Sciences; Professor Benjamin Peirce, Superintendent of the Coast Survey; and Professors of Mathematics Newcomb and Harkness from the Observatory.

Eight teams had to be recruited and trained to use instruments especially designed to photograph and measure the transit.

The equipment was ready by the spring of 1874. The eight parties, each consisting of a chief, an assistant astronomer, and three or four photographers, gathered on the Observatory grounds, where they learned to use the eight portable Transit of Venus stations.

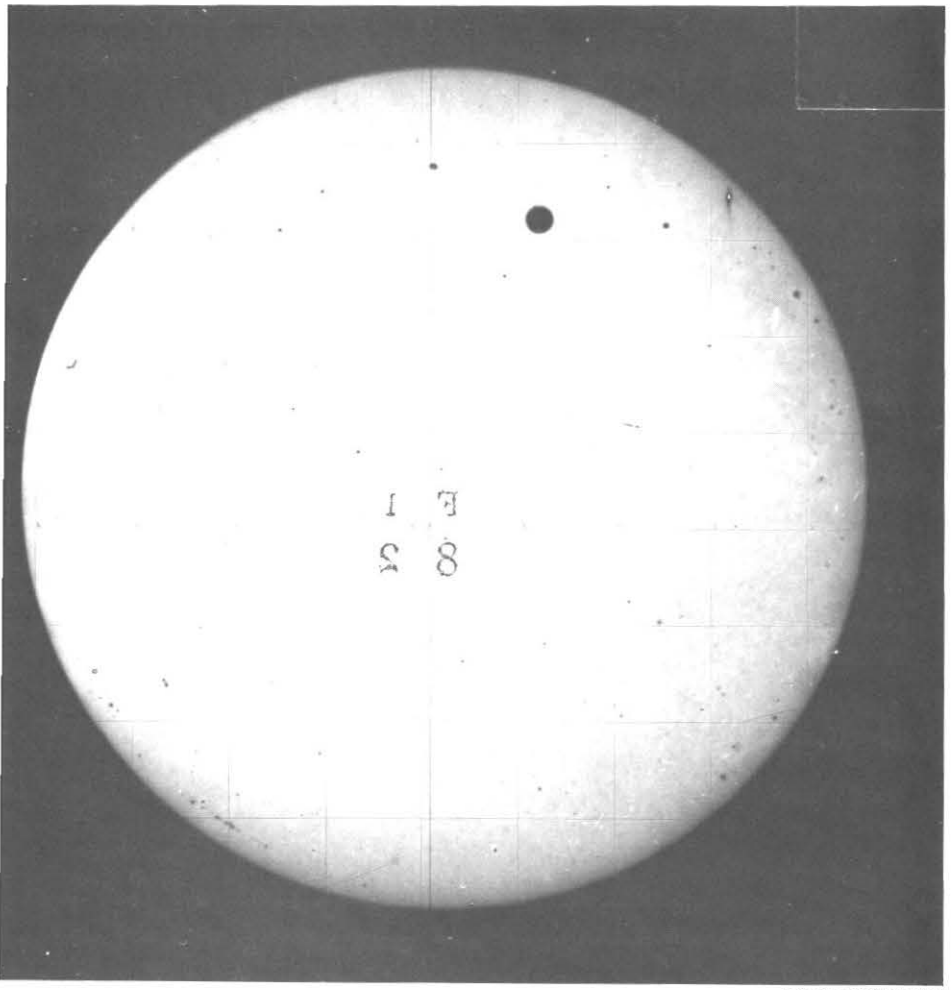
In June the expeditions embarked. The five southern hemisphere parties left aboard a naval vessel, their final destinations Kerguelen Island in the South Indian Ocean; Campbell Town and Hobart, Tasmania; Queenstown, New Zealand; and Chatham Island, 550 miles east of New Zealand.

The northern hemisphere parties left from San Francisco for Nagasaki, Peking, and Vladivostok.

By December, all teams were in place but weather again spoiled the results. On the day of the transit clouds and rain greeted some of the southern hemisphere teams. Those in the northern hemisphere were somewhat luckier, observing the transit both visually and photographically.

The expeditions returned with their data almost a year after setting out, but because additional money had not been appropriated, the Transit of Venus results were never published.*

*Another Transit of Venus visible on the east coast of the United States occurred in 1882 but, by then, more accurate means had been developed to determine the Sun's true distance.



U.S. Naval Observatory

The Observatory's scientists had literally traveled to the ends of the Earth to observe celestial phenomena, often with disappointing results. Now they would not always have to go so far to make dramatic, new discoveries. The largest and most powerful telescope in the world had just been installed on Observatory Hill. —JKH

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(To be continued)

Actinic Cheilitis

Diagnosis, Prevention, and Treatment

LCDR G.E. MacFarlane, DC, USN CDR G.T. Terezhalmy, DC, USN

Ultraviolet (UV) radiation of the vermilion border of the lips can precipitate recurrent herpetic infections, varying degrees of dysplasia, and squamous cell carcinoma. UV light also can aggravate certain systemic conditions, such as lupus erythematosus, and produce solar urticaria, porphyrias, and drug photosensitivity reactions.

The short-term effects of exposure to UV light are transient, but the cumulative long-term effects produce irreversible damage to the lip in all patients. Although degenerative changes have been observed predominantly in men after age 40, the condition now is increasingly recognized in younger men.(*1-3*) The patient population in the military and the requirement for frequent, long-term exposure to sunlight aboard ship and in the field underscore the importance of the clinician's ability to diagnose, prevent, and treat actinic cheilitis.

Diagnosis

Tolerance to sunlight may be categorized conveniently according to skin types. Skin type I burns easily and never tans; skin type II burns easily and tans minimally; skin type III burns moderately and tans gradually; and skin type IV burns minimally and tans readily.(*4*)

People with skin types I and II are particularly prone to actinic damage. Usually, such people have light-colored skin, blue eyes, and blond or red scalp hair. They will exceed their sunburn threshold after only 10-20 minutes exposure to the heat and direct sunlight of a summer noon. People with skin types I and II may present to the clinician with a history of chronic or recurrent crusting, scaling, and occasional ulceration of the lower lip (Figure 1). A history of long-term exposure to direct sunlight usually can be elicited. Clinically, the lip appears dry, mottled, and opalescent, with white or gray plaques that are slightly elevated and cannot be stripped off (Figure 2). Isolated areas of hyperkeratosis may also be evident as well as loss of elasticity and definition of the vermilion border. Other clinical signs include erythematous or hemorrhagic areas, parallel marked folds, and an unobtrusive "chapped lip" appearance. Malignant change is manifested clinically by areas of more intense hyperkeratosis surrounded by diffuse cheilitis and ulcerations of relatively long duration (Figures 3 and 4).

Prevention

The most obvious means of preventing actinic damage to the lips is to avoid long-term exposure to direct sunlight. However, occupational and environmental factors often preclude this. An effective alternative is to apply a chemical or physical sunscreen. Chemical sunscreens absorb potentially hamful UV light, whereas physical sunscreens reflect it. Of the chemical sunscreens, those containing para-aminobenzoic acid (PABA) and certain of its esters provide superior protection.(*5-8*) Other sunscreens include as their active agents benzophenones, cinnamates, salicylates, or anthranilates. Physical sunscreens include such active agents as titanium dioxide, talc, or zinc oxide.

The effectiveness of a sunscreen is expressed in terms of its sunscreen protection factor (SPF). The SPF is a ratio of the time required to produce erythema through a sunscreen and the time required to produce the same effect on unprotected skin. The SPF usually ranges from 2 (minimum protection) to 15 (maximum protection). (*9*) Table 1 presents a selection of sunscreen preparations appropriate for persons with different skin types.

Dr. MacFarlane is on the staff of the Oral Diagnosis Department, National Naval Dental Center, Bethesda, MD 20814. Dr. Terezhalmy is Chairman of the department.

FIGURE 1. Early actinic cheilitis in a 28-year-old male

FIGURE 2. Advanced actinic damage in a 56-year-old male

FIGURE 3. Carcinoma in situ in a 24-year-old male

FIGURE 4. Invasive squamous cell carcinoma in a 58-year-old male

Petroleum-based and cream sunscreens are the most durable, but they can be difficult to keep on the lips because people tend to lick off the residual coating, which lessens the effectiveness of the sunscreen. For this reason, liquid or gel sunscreens provide significantly greater protection for the lips.(*6*)

Sunscreen preparations should be applied uniformly and generously to the lips and all exposed skin surfaces. Two applications 1 hour before exposure to sunlight may be necessary for maximum protection. Reapplication every hour is required to provide adequate continuous protection.

Patients allergic to benzocaine, procaine, paraphenylenediamine, sulfanilamide, thiazides, sulfa drugs, and methylparapen may experience allergic reactions to sunsceens containing PABA or PABA esters. (*4,13*) Contact dermatitis may occasionally develop after the use of PABA, certain PABA esters, benzophenones, or cinnamates.(*4*)

Treatment

The traditional treatment of choice for diffuse, severe cases of actinic cheilitis has been surgical elimination either by excision of the entire vermilion border (vermilionectomy or lip shave) or by horizontal wedge resection. Less severe cases have been treated with numerous topical agents, including corticosteroids, liquid nitrogen, and retinoic acid. The agent 5-fluorouracil, used topically in the treatment of actinic keratosis of the face, has been suggested for the treatment of actinic cheilitis.(*14*) A recent study, however, found that topically applied 5-fluorouracil caused moderate-to-severe irritation of the lips as well as producing only a

questionable histologic improvement of keratotic lesions.(*15*)

Conclusion

To insure adequate protection from harmful UV light, a person should select a sunscreen preparation on the basis of his or her skin type and the product's SPF. Even when using a sunscreen, however, all persons should avoid prolonged exposure to direct sunlight. If a patient's lips manifest marked, chronic degenerative changes, an incisional biopsy is indicated.

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TABLE 1. Sunscreen Preparations for Different Skin Types (4, 10-12)

Product	*Active Agent*
Skin Type I (SPF Range 10-15)	
Coppertone Super Shade 15 Lotion (Plough)	7% octyl dimethyl PABA 3% oxybenzone
Total Eclipse Lotion (Herbert)	3% octyl dimethyl PABA 3% glyceryl PABA 3% oxybenzone
PreSun 15 Lotion (Westwood)	5% PABA 3% oxybenzone 5% padimate 0
Block-Aid Cream (Elder)	6% ethyl dihydroxypropyl PABA 5% oxybenzone
Pabanol Lotion (Elder)	5% PABA
Skin Type II (SPF Range 6-10)	
PreSun 8 Gel, Lotion, or Creamy Lotion (Westwood)	5% PABA
Eclipse Gel or Lotion (Herbert)	3% glyceryl PABA 3% padimate 0
RV PABA Lipstick (Elder)	5% PABA Red petrolatum
Skin Type III (SPF Range 4-6)	
Pabagel (Owen)	5% PABA
Solbar Cream (Person and Covey)	3% dioxybenzone 3% oxybenzone
Uval Lotion (Dorsey)	10% sulisobenzone
PreSun 4 Lotion (Westwood)	4% padimate 0
Skin Type IV (SPF Range 2-4)	
SunDare Clear Lotion (Texas Pharmacal)	1.75% cinoxate
SunDare Creamy Lotion (Texas Pharmacal)	2% cinoxate
Coppertone Lipkote Ointment (Plough)	10% homomenthyl salicylate
RVP Ointment (Elder)	Red petrolatum

Nurse Corps

The overall authority and responsibility for education and training in the Navy Medical Department lies with the Naval Health Sciences Education and Training Command (HSETC), Bethesda, MD. HSETC is under the immediate direction of the Chief, Bureau of Medicine and Surgery (BUMED).

The Nurse Corps Division (Code 34) of the Educational Programs Department, HSETC, plans, coordinates, administers, and evaluates educational programs to meet the requirements for Nurse Corps officers. In addition to administering the Nurse Corps Continuing Education Approval and Recognition Program (CEARP), several educational programs are also administered, funded, and monitored by the division. These programs are outlined below with the current BUMED directive providing guidelines and application procedures for a particular category.

Full-time Duty Under Instruction (DUINS)

BUMEDINST 1520.14G of 21 Aug 1981

This instruction provides guidance for Nurse Corps officers interested in requesting DUINS leading to a baccalaureate or master's degree. Also included in this category are the Nurse Anesthesia Programs at George Washington University and at the Naval School of Health Sciences, the Master of Science billets at the Naval Postgraduate School, Monterey, CA, and Master of Health Care Administration degree in the U.S. Army/Baylor University graduate program.

The next Professional Advisory Board meets in January 1983 to select students for 1983 and some for 1984. All applications must be submitted to HSETC by 15 Nov 1982. It is highly recommended that Nurse Corps officers apply as soon as they are within 18 months of their PRD.

Part-time Outservice Training (PTOS) (Tuition Assistance)

BUMEDINST 1500.7D of 27 Feb 1975

Nurse Corps officers interested in full-time duty under instruction can frequently satisfy prerequisites and obtain transferrable credits through this program.

Requests for PROS must reach HSETC 6 weeks before courses convene. Funding is authorized for *tuition only* and does not include textbooks, examinations, or other fees.

BUMEDINST 4651.1C of 7 Feb 1980

With the rapid increase in technology, advances in medical science and changing health care concepts, continuing education for Nurse Corps officers is a vital component of quality health care. Funding for continuing education is the responsibility of local commanding officers. However, HSETC has limited funds available for attendance at those civilian and military short courses, workshops, and seminars which award continuing education credit. These funds must be used judiciously; they do not include conferences, conventions, or job-training courses. Requests for funding should arrive in HSETC at least 6 weeks before the course begins and must be accompanied by the descriptive program flyer or brochure. Normally, cross-country travel will not be authorized for courses.

HSETC annually co-sponsors, with the Naval School of Health Sciences, Bethesda, MD, courses relevant to the mission of the Nurse Corps. It is anticipated that the FY83 Nurse Corps education calendar will be similar to FY82 and include the following courses:

- Directors of Nursing Service Workshop;
- Educational Coordinators Workshop;
- Mid-level Management Seminar;
- Senior Management Workshop; and
- Operational Readiness Update Courses (three).

In 1981 HSETC received a 4-year accreditation by the Northeast Regional Accrediting Committee of the American Nurses' Association as a provider and approver of continuing education.

It is impossible to cover every aspect of nursing education news in an article. Each Nurse Corps officer, after reviewing the BUMED instruction pertaining to their area of interest, should contact the Director, Nursing Service, Nursing Educational office, or CDR S.A. Holmes, NC, Code 34, HSETC, for further information. Telephone: Autovon 295-0630/31, Commercial (202) 295-0630/31. □

Medical Service Corps

The Medical Service Corps Division (Code 33) of the Educational Programs Department, HSETC, makes funding available to MSC officers for a variety of education and training experiences. The division is staffed by LCDR J.L. Higgins, MSC, Program Director, and Mrs. Peggy Roche, Education Coordinator.

The categories of training for which funds are budgeted include continuing education (workshops, seminars, conferences), certification exams, full- and part-time training, short courses conducted by the Naval School of Health Sciences, operational training, and the Practical Comptrollership Course held at the Naval Postgraduate School, Monterey, CA. HSETC does not fund the Professional Military Comptrollership Course held at Maxwell Air Force Base, Montgomery, AL, but does receive and coordinate the requests for attendance at that course.

Procedures and guidelines to apply for funding are provided in the following BUMED directives:

- BUMEDINST 4651.1C of 7 Feb 1980 (Continuing Education);
- BUMEDINST 1500.4G of 6 June 1978 (Boards/Certification);
- BUMEDINST 1500.7D of 27 Feb 1975 (Part-time Outservice Training);
- BUMEDINST 1520.12K of 22 June 1981 (Full-time Outservice Training); and
- BUMEDNOTE 5300 of 26 Oct 1981 (Practical and Professional Comptroller Courses).

With the availability of resources and adherence to the provisions of the appropriate instruction, a continuing education request will generally be approved if it is cost-effective, appropriate for the applicant's specialty, will be of benefit to the Navy, and is received by HSETC at least 6 weeks before the convening date of training. A descriptive flyer or brochure describing the training should accompany the request. Since resources are always limited, timely submission of a complete and accurate request is essential, although it does not always guarantee a request will be approved. HSETC will act upon written requests only. Verbal requests for endorsement will not be granted.

The Medical Service Corps Training Advisory Board meets in October to select a limited number of MSC officers for full-time training beginning the following year. In order to organize and prepare applications for submission to the board, each must be received by HSETC (Code 33) no later than 1 Sept. Complete, accurate, timely submission is important. Applications for graduate level study must also include GRE or GMAT scores as appropriate and all other enclosures requested by the full-time instruction. All applicants will be notified of their selection/nonselection for full-time training as soon as possible after the board adjourns.

In requesting support for education and training MSC officers must evaluate their desires in terms of subspecialty, projected rotation date, and obligated service. Pursuit of additional training should be considered as to professional goals, available opportunities, and costs. Navy staffing requirements ultimately determine training assignments.

The following programs are presented in brief form. Specific details are contained in the current instructions.

Full-time Duty Under Instruction (BUMEDINST 1520.12 series)

Active duty obligation is incurred for all training over 26 weeks in length. Programs include:

- **Training in Civilian Institutions.** Attendance up to 1 year at the undergraduate level and 2 years at the graduate level may be supported to meet the training needs of the various specialties.
- **U.S. Army/Baylor University Program in Health Care Administration, Fort Sam Houston, TX.** This is a two-phase master's degree program in health care administration. Forty-two weeks of didactic instruction at the Academy of Health Sciences, Fort Sam Houston, is followed by an administrative residency at naval medical facilities selected by the Bureau. GMAT scores above 499 or GRE scores about 999 are essential prerequisites.
- **Naval Postgraduate School, Monterey, CA.** This institution offers master's degree level education in computer systems, financial, manpower, or human resource management. Program varies from 12 to 18 months depending upon previous training and the specific program.
- **Blood Bank Fellowship at Walter Reed Army Medical Center, Washington, DC.** This 1-year course is designed to prepare medical technologists to be blood bank directors. The program includes all phases of military blood-banking, blood-grouping, and blood transfusion.
- **Pharmacy Residency at NNMC Bethesda, MD, and NRMC San Diego, CA.** Provides a postgraduate learning experience in institutional pharmacy practice. This program is certified by the American Society of Hospital Pharmacists and is 1 year.
- **Podiatry Residency at NRMC Oakland, CA.** This 1-year curriculum is designed to provide podiatric officers with a broad knowledge of medicine and surgery that relates significantly to the practice of military podiatry.

Application deadline for the above programs is 1 Sept 1982.

• **Service Colleges.** Attendance at service colleges represents a rare opportunity for outstanding officers to acquire both didactic and practical experiences in military operations planning and management. Available service college programs include:

(1) *Industrial College of the Armed Forces, Fort McNair, Washington, DC.* Offers a 10-month graduate level program in national security placing emphasis on management of national resources under current and predicted environments. Included is the study of national and world military, economic, political, scientific, and social factors. The program is intended to enhance the preparation of selected military officers for positions of high trust in the national and international security structures.

(2) *Marine Corps Development and Education Command, Quantico, VA.* The Amphibious Warfare Course is a 9-month professional military program intended to prepare MSC officers for command and staff duties at battalion, squadron, regiment, group, and Marine amphibious bridgade levels. Included is instruction in support provided by the Navy in the conduct of amphibious operations, command relationships, and interstaff coordination requirements.

(3) *Command and Staff College.* Offers a 10-month course providing professional military education for higher level command and staff duty within the Marine Corps. It stresses the planning and conduct of force-in-readiness operations as a component of the balanced fleet. The course includes military management with emphasis on decisionmaking, planning, programming, budgeting, and the use of computers. Considerable emphasis is placed on executive leadership and effective communications.

(4) *Armed Forces Staff College, Norfolk, VA.* Offers a 6-month program for a unique opportunity to study the concepts and principles of joint and combined military operations. The program provides the student with an understanding of the U.S. military capability and the application of traditional service dogma to joint and combined operations in the current environment.

(5) *Naval War College (Command and Staff) Newport, RI.* Offers a 10-month program focusing on naval and amphibious warfare operations within the context of international strategies. This professional military educational experience fully prepares MSC officers for senior planning positions at fleet and headquarters where policies are developed and applied.

Interested officers are encouraged to indicate their service college desires in the "Remarks" section of the Officer Preference Cards. Service college selections are made in August by a special board convened by the Commander, Naval Military Personnel Command.

Part-time Outservice Training (BUMEDINST 1500.7 series)

Provides partial sponsorship for evening or weekend courses in accredited civilian institutions. Courses requested must be directly related to areas of Medical Department responsibility. The program permits officers to begin work on advanced degrees prior to application for full-time training. The active duty obligation is 2 years following completion of the last approved course.

Continuing Education (BUMEDINST 4651.1)

Continuing education is essential for maintaining professional competence due to the rapid changes in the technology, administration, and delivery of health care, and the increasing emphasis on accountability. Participation in short courses and seminars as set forth in this program is one means by which MSC officers can keep abreast of the latest advances and events in their profession. In the current austere travel funding environment, officers are strongly encouraged to pursue continuing education opportunities in or near their geographic locales. Realizing that this may preclude attendance at "the best" course for any particular officer at any time, it will allow more officers to attend more courses which are at least adequate for current needs.

The reporting of all educational achievements to the Naval Military Personnel Command (NMPC-4415), BUMED-2311, and HSETC-33 is extremely important. This information becomes part of an officer's permanent record which is consulted in many personnel management processes such as assignments and selection for full-time training.

Further assistance may be obtained by contacting LCDR Higgins or Mrs. Roche at HSETC, Bethesda, MD 20814. Telephone: Autovon 295-0625, Commercial (202) 295-0625. □

Warrant Officer and Enlisted Programs

Warrant Officer and Enlisted Programs (Code 35) is a division of the Educational Programs Department at HSETC. The division is responsible for the education and training of Navy physician assistants, Hospital Corps personnel, and dental technicians. Several educational programs are administered and funded by the division including part-time outservice training, continuing education, and certification/recertification examinations. These programs are listed below with the appropriate BUMED directive to be followed when completing applications.

Programs Applicable to Physician Assistants

- Part-time Outservice Training (Tuition Assistant) BUMEDINST 1500.7D of 27 Feb 1975
- Continuing Education, BUMEDINST 4651.1C of 7 Feb 1980
- Certification/Recertification Examination, BUMEDINST 1500.4G of 6 June 1978

Physician assistants applying for the 1982 National Certification Examination should submit only one TAD request to include fees, travel, and per diem. Fees will be reimbursed upon completion of TAD orders.

Participants are encouraged to apply for TAD when the examination site has been determined. The examination site must be the *nearest* site to the participant's command.

Programs Applicable to Hospital Corps and Dental Technicians

- Continuing Education, BUMEDINST 4651.1C of 7 Feb 1980

Limited funds are available for short courses and workshops which are relative to the individual's NEC.

- Part-time Outservice Training (Tuition Assistance), BUMEDINST 1500.7D of 27 Feb 1975

Funding has been increased to 90 percent for E-5 and above under 14 years active service.

- Certification Examinations, BUMEDINST 1500.4G of 6 June 1978

All applications for part-time outservice training and continuing education must reach HSETC 6 weeks before the convening date of training. Funding for textbooks is not authorized. Applications should be submitted to Naval Health Sciences Education and Training Command (Code 35), National Naval Medical Center, Bethesda, MD 20814.

Personnel having any questions and/or suggestions pertaining to warrant officer and enlisted programs should contact CDR N.D. Reuter, MSC, Autovon 295-1729, Commercial (202) 295-1729, DTCS K.E. Nay, Autovon 295-0925, Commercial (202) 295-0925, HMC J.L. Johnson, Autovon 295-1729, Commercial (202) 295-1729. □

HM/DT "C" School Applications Needed

Continued commanding officer/officer in charge, staff officer, MCPOC, career counselor, and senior petty officer support is requested in recruiting qualified applicants for advanced technician schools leading to assignment of the following NECs:

HM-8402—Nuclear Submarine Medicine Technician (E5-E7). Must have at least 6 years medical experience. NEC HM-8425 is a prerequisite. Applicants not holding NEC 8425 will be assigned to 46 weeks advanced HM school at San Diego or Portsmouth and then 15 weeks SUBMEDTECH school at New London. SRB eligible NEC. Consult CANTRAC for further details. Contact HM detailer at NMPC-407, Autovon 224-4547.

HM-8407—Nuclear Medicine Technician (Surface). Now open to E-4 through E-7. Consult CANTRAC for details.

HM-8409—Aviation Physiology Technician (E4-E6). HM-8406 is a prerequisite. Applicants not holding NEC 8406 will be assigned to AVMEDTECH school at Pensacola and then 8409 school. Special duty pay eligible NEC. Consult CANTRAC for details.

HM-8425—Advanced Hospital Corpsman (E5-E7). Must have at least 6 years medical experience. Consult CANTRAC for details. Applicants for San Diego school particularly needed. Portsmouth classes are filled for remainder of FY82. Schools are affiliated with George Washington University in granting 66 credit hours toward degree programs.

HM-8445—Advanced Ocular Technician (E3-E5). NEC 8444 is a prerequisite. Applicants not holding NEC 8444 will attend ocular tech school at San Diego with follow-on surgical training. Consult CANTRAC for details. *Note:* 1 year experience as HM-8444 requirement is waiverable.

HM-8452—Advanced X-ray Technician (E3-E5). NEC 8451 is a prerequisite. Applicants not holding NEC 8451 will attend basic x-ray tech school at NRMC Oakland.

SRB eligible NEC. Consult CANTRAC for details. *Note:* 1 year experience as HM-8451 requirement is waiverable. Advanced x-ray curriculum has been revised to include the latest in state-of-the-art special procedures and ultrasound technology.

HM-8463—Optician Technician. Now open to E-3 through E-6. Upon completion students will receive a total of 73 credit hours toward an Associate in Applied Science degree from Thomas Nelson Community College and will qualify technicians to take the optician certification examination through the American Board of Opticians (ABO). Consult CANTRAC for details.

HM-8482—Pharmacy Technician (E3-E6). Curriculum has incorporated the unit dose and IV additive system similar to that used in civilian hospitals. Consult CANTRAC for details.

HM-8483—Operating Room Technician (E2-E4). Opportunity to be the key member of a surgical team as scrub technician working with physicians performing state-of-the-art surgery in surgical disciplines, i.e., neurosurgery, microsurgery, laser surgery. Consult CANTRAC for details.

HM-8492—Special Operations Technician (SOT) (E2-E6). Many exciting challenges await the SOT when assigned to special warfare activities. Must have completed BUD/S indoctrination training. SRB-eligible NEC. Consult CANTRAC and MILPERSMAN 1410380.

HM-8503—Histopathology Technician (E4-E5). HM-8501 prerequisite. Must have normal color vision. HM-8501 prerequisite can be considered waiverable. Consult CANTRAC for details.

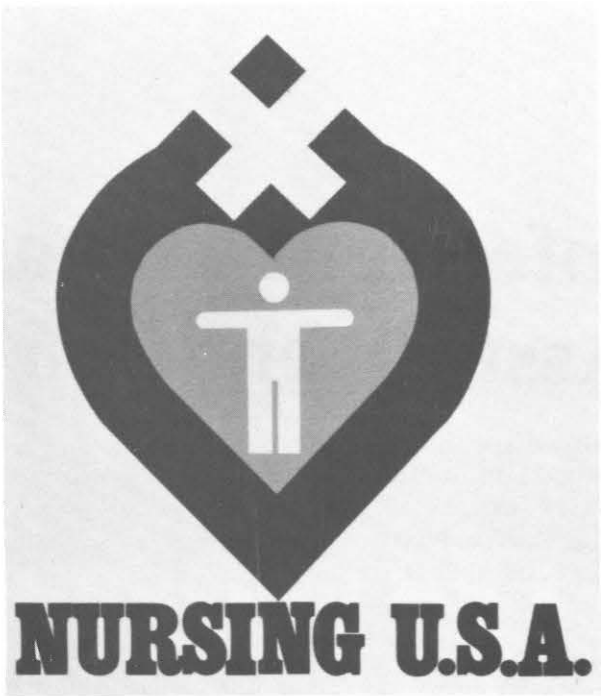
DT-8752 Dental Laboratory Technician, Basic. E3-E4 applications urgently needed. Critical shortage NEC. School at San Diego for 24 weeks. NEC now restricted to E-3 through E-6. Outstanding career field in fabrication of dental prostheses. Experienced 8752s then go on to 8753 school. Consult CANTRAC. Seek career Counselor advice. Contact DT detailer at NMPC, Autovon 224-4547.

DT-8753 Dental Laboratory Technician, Advanced. Applications from E5-E6. DT-8752s urgently needed. Critical shortage NEC. School at San Diego for 24 weeks. NEC now open from E-5 through E-8. Consult Career Counselor and CANTRAC. Contact DT Detailer, Autovon 224-4547.

Commands should insure member complies with TRANSMAN Chapter 24 requirement to OBLISERV within 15 days after receiving EPAD from NMPC.

The HM/DT Division at BUMED (MED-25) has been reorganized. CAPT W.H. Benedict, MSC, is Director, HMCM W.E. Raysick is Deputy Director of the Hospital Corps, and DTCM H.R. Moeller is Deputy Director of Dental Technicians. Telephone: Autovon 294-4682, Commercial (202) 254-4682. □

New Nursing Symbol



HM1 Geronimo M. Esteron recently won $3,000 from the publishers of *Health Care Horizon* for designing a national logo for the nursing profession. The design speaks for itself and represents love and care. Artist Esteron, who once worked as an assistant art director for a leading publishing house in the Philippines, is presently attached to NNMC Bethesda, MD, as a medical photography student.

HM1 Esteron

Infectious Disease Risk Assessment in Military Operations

LT Gary Pazzaglia, MSC, USNR
CDR Richard I. Walker, MSC, USN
Eleanor R. Cross
Charles Sheffield, Ph.D.
James G. Olson, Ph.D.

The briefing room was cloudy with smoke, and the tired faces of the field commanders told the story. MAJ Johnson had just informed the group that it would be a minimum of 2 weeks until the arrival of the much needed medical supplies and replacement personnel. It had been explained that the mission planners had no way of knowing that casualties from infectious diseases would threaten the outcome of the entire operation. Although careful consideration had been given to anticipated losses due to combat casualties, the scanty disease information available for this area of the world had not permitted an accurate appraisal of the short-term risk of disease casualties. Medical support had been estimated from the needs encountered in similar operations in other areas of the world. Additionally, because there had been no reported foci of sandfly fever in this area during the previous 20 years, the medical support planners had considered this disease only a minor threat.

During the first 2 weeks of the operation, however, more than 40 percent of the ground forces had been rendered ineffective by this disease, and by the third week personnel strengths in key defensive positions reached critically low levels. The enemy, apparently immune due to long-term exposure since childhood, was undaunted by the disease and continued to grow daily in strength and aggressiveness. The field commanders were faced with the difficult decision of whether to abort the mission or run the risk of being completely overrun by the enemy.

This scenario is, of course, fictional, but the fact that many wars and battles have been lost because of disease underscores the importance of having adequate disease information for planning military operations in foreign environments. As in our example, there is often very little disease information available for remote areas of the world. The information on hand is usually specific for an indigenous population having markedly less susceptibility to those infections that could decimate our own combat personnel.

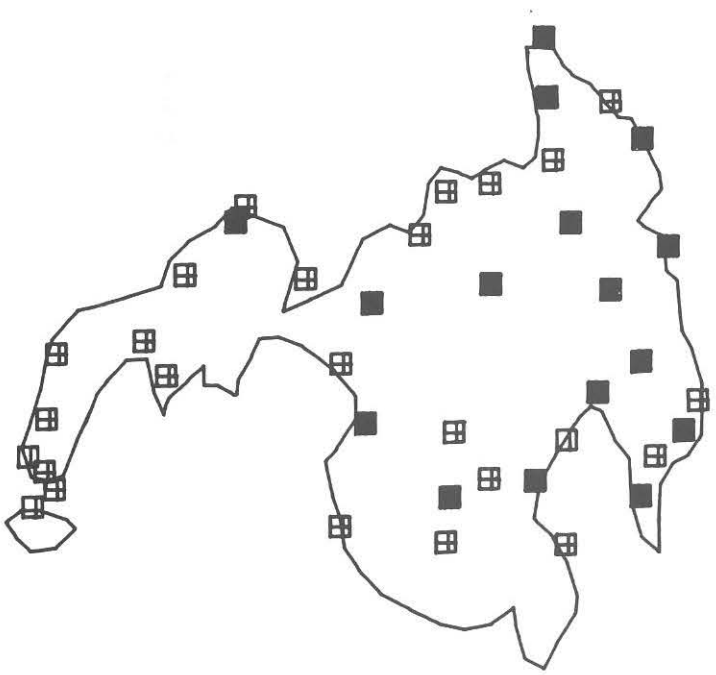
There would be an obvious benefit from the ability to forecast what infectious hazards may be encountered and what risk they would pose to non-immune personnel in areas where the disease threat is poorly documented. Presently, a group of scientists at the Naval Medical Research Institute (NMRI) is gathering information and developing methodologies that could result in the computer-assisted evaluation of the infectious disease risks likely to be incurred by overseas military combatants.

Among the infectious diseases considered to be of significant military importance are malaria, dengue, yellow fever, typhus, amebiasis, schistosomiasis, plague, trypanosomiasis, leishmaniasis, leptospirosis, and sandfly fever. These diseases are capable of endangering an overseas combat force by incapacitating large numbers of personnel in a relatively short time.

LT Pazzaglia is an epidemiologist on the staff of the Medical Microbiology Branch, Naval Medical Research Institute (NMRI), Bethesda, MD 20814. CDR Walker is Head of the Medical Microbiology Branch. Eleanor R. Cross is a medical geographer on the NMRI staff. Dr. Sheffield is a physicist with the Earth Satellite Corporation, Bethesda, MD 20814. Dr. Olson is an epidemiologist with the Arbovirus Research Unit, Yale University School of Medicine, New Haven, CT 06510.

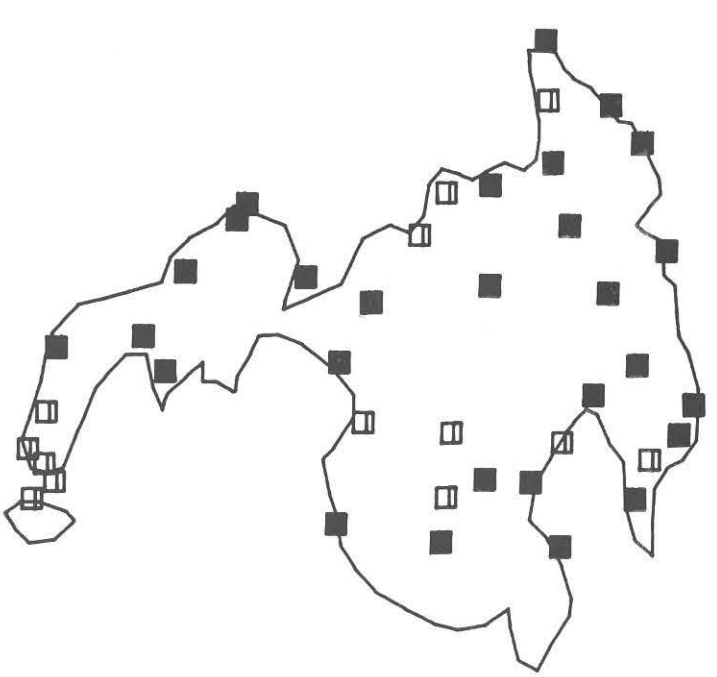
Photos by HM3 D.P. Kelly

Dr. Charles Sheffield examines satellite meteorological contour maps.



■ *S. japonicum* present
◫ S. japonicum absent
⊞ No information available

A computer-generated map of Mindanao, the Philippines, showing the reported distribution of Schistosomiasis japonicum.



■ *S. japonicum* present
◫ *S. japonicum* absent

A computer-generated map of Mindanao, the Philippines, showing the distribution of Schistosomiasis japonicum *as predicted from a mathematical model of the disease.*

Dr. Linda Zall identifies water bodies for environmental studies.

John Berry evaluates geological structures of Landsat imagery.

John Hunter prepares a large scale photocopier used to produce prints of satellite imagery.

Although effective immunoprophylaxis exists for plague and yellow fever, the most effective means of controlling the remaining diseases has been through the use of chemoprophylactics, environmental manipulation, vector control, or some combination of the three. These preventive measures have met with limited success in previous military experiences, as each campaign has its own particular disease problems associated with the geographic, environmental, ecologic, and military factors of that operation. It is rare that disease problems are anticipated before their appearance.

In the future it may be possible to predict accurately the presence of militarily important diseases in a specific locale based on a multitude of environmental variables. These diseases are strongly dependent on the presence of appropriate ecological factors. The ecological approach to disease causation, or the ideal that diseases may be connected with certain aspects of man's environment, has been around for a long time. Hippocrates, in *On Airs, Waters, and Places,* wrote that in order to investigate disease one should consider such factors as seasonal changes, geographic location, the quality of drinking water, the living standards of local inhabitants, and the influence of job and exercise.

In military preventive medicine, such concepts are usually applied after the fact. The usual approach to risk evaluation and prevention programs in overseas operations, for all except the most obvious disease threats, is wait and see. This approach is heavily dependent on data collected after the problem presents itself, allowing personnel to respond to a situation rather than to prevent it. Our ability to evaluate disease risks before entering a new military environment is largely limited to our awareness of similar problems in similar areas and the control measures developed to deal with previous military disease experiences. The capability to coalesce other known epidemiologic and environmental information into a picture of the local disease ecology before entering the area could greatly influence the direction and outcome of military operations.

The eventual development of a computer-assisted system for evaluation of disease risks has broad application to the strategic aspects of operation planning. Questions that may be reasonably answered would include:

- What diseases are expected to be encountered and what would be the actual course of an epidemic should it occur?
- What preventive measures will allow the maintenance of maximum personnel strengths?
- What special activities are especially subject to disease risks?

Carl Selsky adjusts scale of satellite image for use with standard maps.

Such a system may also assist medical support planners by supplying information on the requirements for medical supplies, immunizations, support personnel, and the preparedness of medical personnel to deal with the most likely disease situations. Clearly, the crucial problem in the assessment of disease risks, and the development of contingencies to deal with expected personnel losses due to infectious diseases, centers around our ability to determine what diseases we expect and what will be their magnitude and direction in our personnel should they occur.

Current Research

A model helps visualize something that cannot be directly observed. A successful model is one that explains the current situation and, if change is expected, predicts what will happen. "Model" is best described in terms of its function or purpose. Pielou(*1*) describes ecological modeling as the effort by an investigator to envisage a hypothetical system sufficiently realistic in the biological sense to approximate the truth. By simulating natural processes, the model enables him to predict future developments in the real system with approximate correctness.

In order to develop a realistic disease model, one must consider many interactions between the environment, the human host, and the disease organism. A basic tenet of epidemiology is that the occurrence of disease in an ecological system cannot be attributed to any one factor acting alone. In general conversation we are used to the idea that a particular organism is "the cause" of some disease or outbreak. We must remind ourselves that contact with a disease organism is not sufficient cause for illness and cannot, therefore, be considered as "the cause." In reality, the occurrence of disease in man is a complex biological process resulting from many host and environmental factors acting independently and together to produce the disease state. This is the multifactorial theory of disease causation. The Infectious Disease Risk Assessment Program at NMRI applies these concepts to the problem of disease modeling.

The NMRI investigative team includes not only a core of scientists from various disciplines within the Medical Microbiology Branch, but also other naval and civilian personnel at several academic institutions and naval commands. This broad base of expertise is principally a result of the multidisciplinary approach to the problem and employs the skills of epidemiologists, microbiologists, virologists, medical geographers, computer scientists, image analysts, parasitologists, and statisticians.

Early modeling endeavors at NMRI focused on the development of computer models capable of predicting the geographic distribution of schistosomiasis in the Caribbean and the Philippines. These models were based principally on weather data assimilated from weather stations located in these two areas. Other factors were later incorporated into the model to improve its efficiency. This effort resulted in a discriminant function model capable of correctly classifying over 90 percent of the study sites according to disease present, absent, or unknown. The data base of weather information has been expanded to over 150 countries.

Presently, NMRI scientists are studying the feasibility of using infrared data remotely sensed from satellites as a source of environmental information for the development of vector-borne disease models. The current pilot study, projected to be completed by this summer, will provide a multivariate model of the distribution of Japanese encephalitis on Taiwan, based on the infrared spectral characteristics associated with the known geographic patterns of disease. In order to accomplish this, Navy virologists and epidemiologists at Yale University performed sero-epidemiological studies.

This research provided incidence rates of Japanese encephalitis for specific geographic locations on Taiwan. The data were compiled with additional physical, demographic, and weather variables for each site of known disease occurrence or non-occurrence. Once computerized, the information underwent statistical analysis for correlation with specific infrared reflectance characteristics of the terrain as viewed from satellite sensors. The image analysis was accomplished with an image processor that computes frequency distributions of points of resolution having particular values along the electromagnetic spectrum. These frequency distributions were then analyzed for common patterns among disease sites and provided an environmental "signature" of the study disease. The signatures, when coupled with the additional physical and weather variables in a mathematical relationship, can help locate other areas having similar characteristics to those areas in which the disease is predicted to occur.

Preliminary findings have shown that these spectral patterns correlate highly with patterns of disease occurrence. As more refined environmental parameters, such as elevation, rainfall, and temperature are added to the model system, the accuracy of model predictions should greatly improve.

Computer mapping is being developed through programs available at the National Institutes of Health (NIH). We can now generate by computer maps of many countries of the world and we are in the process of modifying existing programs in order to pinpoint disease foci within very small areas. This capability will be extremely useful if future risk assessment is to be centered around computer-generated images of target areas.

The ability to associate specific geographic areas with some likelihood of disease occurrence is not, in itself, sufficient for adequate assessment of infectious disease risk. Equally important is the ability to predict the number of new infections occurring over a span of time, should an outbreak occur. To address this problem, NMRI scientists are collaborating with an investigative group at the U.S. Department of Agriculture research laboratory in Gainesville, FL. Their efforts have resulted in the development of a computer-based epidemic simulation model for malaria. Given basic information such as the number of non-immune personnel, the number of initial cases, and certain parameters related to the likelihood of being bitten by an infected mosquito, the model can trace the course of an outbreak through a human population. This test model will be developed into a generalized approach to computer epidemic modeling. With refinements, the model can then be combined with existing remote sensing-based disease distribution models into a comprehensive computer-based system for risk evaluation.

Future Studies

The merging of disease distribution and epidemic modeling approaches will provide the first system for totally assessing future risks of infectious disease in military personnel. Continued efforts will be made to further enlarge, update, and refine model systems by adding information concerning new diseases in other geographic areas. Extensive field studies will be required to develop more appropriate data for system testing to insure the accuracy and validity of new models as they become available. Combined with the early system trials, these field studies may also give us important insights regarding associations between disease and environment (e.g. new vectors, new vector habitats, and new methods of environmental control). Peripheral observations may generate a number of new avenues of infectious disease research, especially in the areas of entomology, parasitology, and epidemiology.

Field trials for the actual on-line computer systems may occur as early as 1986 and will provide line officers and strategic planners with instantaneous predictions for the number and type of infectious disease casualties which can be expected in many areas of strategic concern. Future system refinements may aid planners in assessing requirements for personnel, equipment, and supplies to deal adequately with anticipated infectious disease casualties for a defined force of combatants.

Reference

1. Pielou EC: *An Introduction to Mathematical Ecology*. New York, John Wiley & Sons, 1969. □

Terrorism and Hostage-Taking
The Mental Health Connection

LCDR Cassie L. Wesselius, MC, USNR

Terrorism can be motivated by guerrillas espousing violent political or social change or by perpetrators of individual nonpolitical crimes. Unfortunately, terrorism as a weapon is becoming more commonplace. With the ready theater provided by modern media, many dissidents have turned to terrorism to dramatize their demands and ideologies. In countries torn by chaos or social unrest, governments may unwittingly contribute to terrorism by becoming more repressive in their efforts to apprehend and imprison the would-be rebels and terrorists. With repression comes additional enemies, and the rebel groups gain more friends and supporters. Taking hostages can provide terrorists with publicity for their cause, freedom for imprisoned comrades, money, safe passage, arms, and government concessions.

In the past, some countries have refused to negotiate with terrorists holding hostages. This policy was justified by the goal of saving future lives through discouragement of terrorist activities. It was thought that if no reward was forthcoming, the behavior would stop. Unfortunately, this has not always worked as planned.(*1,2*)

The terrorism problem is growing. Whether or not to negotiate in the event of a political hostage-taking is beyond the scope of this paper and is a matter of political and governmental policy. Negotiating in the nonpolitical hostage-taking episode lies within the realm of local government and law enforcement agencies. In the United States law enforcement negotiations have been successful in resolving hostage-taking episodes without hostage death in over 90 percent of negotiation attempts.(*3*)

Mental health professionals have certain skills that are increasingly in demand as a result of the increase in hostage-taking activity, whether for political or criminal reasons. Unfortunately, training requirements for mental health professionals have yet to be officially clarified.* A complicating factor is that resource materials are frequently and necessarily classified.

The mental health professional fits into a role of an advisor to the negotiating team in a hostage situation. Mental health professionals have extensive training in personality, dynamics, and the psychological components of behavior. With that background they can understand the more specific motivations and behavioral styles of hostage-takers. This involves study of individual terrorists, criminal personalities, terrorist groups, terrorism in general, and the goals motivating terrorist groups. Although they do not do the actual negotiating, advisors must be thoroughly trained in negotiating techniques.

Another area of study is hostage or victim response to the crisis. It would be an understatement to say that being taken hostage is a very traumatic event. The nature of the hostage's response is important as it concerns the internal psychological welfare of the hostage and has implications for the hostage's influence on the behavior of the hostage-taker. To complicate this psychological tangle, sophisticated hostage-takers, particularly terrorists, may read the terrorist literature. They may devise methods of out-manipulating the negotiators to avoid behavior that would affect their own ability to slay the hostage, should their demands not be met. The negotiator advisor monitors these psychological systems and watches for signs of lost objectivity or severe stress in the law enforcement negotiator.

The mental health professional makes psychological profiles of the hostages and the hostage-takers with available intelligence information to further clarify the events that are happening in the hostage-holding area. Hopefully, predictions are formed about the dangers that are most imminent to the lives of the hostages. Profiles also outline the hostage-takers' interrelationships and the power struggles between them. Without certain interventions, a power struggle between the hostage-takers can lead to violence and death for the hostages.

Detecting these issues and the effects of stress on all parties involved is part of the job of the mental health professional advisor. He or she may also contribute to the strategic approach chosen by the negotiator in his interactions with the hostage-taker. Pointing out and calming the fury evoked in the negotiator may prevent

Dr. Wesselius is on the staff of the Clinical Investigation Center, NRMC San Diego, CA 92134.

*NRMC San Diego has already formed a Hostage and Terrorist Negotiator Advisory Team to have mental health professionals' skills in dealing with hostage-taking incidents.

negotiations from becoming an angry battle where the hostages lose their lives or are hurt in other ways. In addition, once released, hostages frequently require skillful psychiatric crisis intervention and referral for psychological followup treatment.

The role of the advisor clearly involves special expertise and knowledge. The mental health professional possesses certain skills relative to this role. The ultimate goal in using these skills will be saving hostages' lives. Current societal trends indicate a growing need for expertise in dealing with criminal and terrorist hostage-takers. Techniques offered by the mental health professional may provide further options for governmental and law enforcement response to hostage-taking. The negotiation process should be as effective and expert as possible for the protection of hostages and society in general. It is a certainty that some people who today take their freedom for granted will one day be held hostage at gunpoint.

This specialized area is not for all mental health professionals. A mental health professional not trained in these areas may be asked by local authorities for his or her help. State Department psychiatrist and negotiator advisor, Robert Blum, says that in this instance, "Unless a patient of his might be involved, he should tell the authorities to call the FBI. That's all. Do nothing else."(*4*) However, for those mental health professional interested and trained for negotiator teams as advisors, it is a challenging and timely field.

References

1. Evans E: *Calling a Truce to Terror.* Westport, CT, London, Greenwood Press, 1978, chap 6.

2. Alexander Y, Carlton D, Wilkinson P: *Terrorism: Theory and Practice in Hostage Negotiations and the Concept of Transference.* Boulder, CO, Westview Press, 1979, chap 6, p 138.

3. FBI Academy, Special Operations and Research Unit, Hostage Negotiation School, 1981.

4. Psyching out terrorists. *Medical World News,* p 17, June 27, 1977. □

Notes & Announcements

IN MEMORIAM

LCDR *Daniel G. Reder,* DC, USN, died 10 May 1982 in San Diego, CA.

Born 14 Nov 1951, LCDR Reder graduated from the University of Texas, Health Sciences Center at the Houston Dental Branch.

LCDR Reder completed a postdoctoral fellowship in oral surgery at NRDC San Diego, where he was stationed at the time of his death.

HEALTH AFFAIRS SUPERIOR ACHIEVEMENT

CAPT James J. Quinn, MC, USN, Commanding Officer of NRMC Jacksonville, FL, was recently selected as the first recipient of the Annual Health Affairs Superior Achievement Award for Medical Cost Containment for the year 1981.

The Annual Health Affairs Superior Achievement Awards were established by the Assistant Secretary of Defense for Health Affairs to recognize superior achievement in medical readiness and medical cost containment. This award is presented annually to individuals and organizations, military and civilian, whose contributions to these areas warrant special recognition.

CAPT Quinn was recognized for his efforts which resulted in the savings of dollars for the Medical Department while increasing the quality of care. Through his innovative management and leadership, a dramatic decrease in CHAMPUS expenditures was realized as well as decreases in other medically related expenditures.

FLIGHT SURGEON WANTED

The Navy Flight Demonstration Squadron will need a flight surgeon beginning January 1983.

For information write: Navy Flight Demonstration Squadron, Blue Angels, NAS Pensacola, FL 32508 or call LCDR Wand or LCDR Boor, Autovon: 922-2583, Commercial: (904) 452-2583.

TECHNICAL COURSE

A course entitled "Laser, Microwaves, Ultraviolet, and Ultrasound: Biophysical and Biological Basis, Applications, and Hazards in Medicine and Industry" will be held 9-13 Aug 1982 at the Massachusetts Institute of Technology, Cambridge, MA.

The course will emphasize practical considerations in safe and effective use of these modalities in medical and industrial practice, e.g., methods and instrumentation for power measurement, calibration, dosimetry, compliance with Federal and State regulations, etc.

Tuition is $775. The program is approved for nine continuing education credits by the American Board of Health Physics and for two credits toward maintenance of certification by the American Board of Industrial Hygiene.

For further information contact the Director of Summer Sessions, Room E19-356, M.I.T., Cambridge, MA 02139.

SAC CONFERENCE

The Surgeon General's 14th Annual Specialties Advisory Conference and Committees' Meeting (SAC) will be held 12-17 Sept 1982 at the Bethesda Marriott Hotel, Bethesda, MD.

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